INDUSTRIAL HYGIENE SAMPLING GUIDE FOR CONSOLIDATED INDUSTRIAL HYGIENE LABORATORIES (CIHLs)

Prepared by

NAVY ENVIRONMENTAL HEALTH CENTER
2510 WALMER AVENUE
NORFOLK, VIRGINIA 23513-2617

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(CIHLs)

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INDUSTRIAL HYGIENE SAMPLING GUIDE FOR CONSOLIDATED INDUSTRIAL HYGIENE LABORATORIES (CIHLs)

INTRODUCTION

This guide contains a compilation of sampling and analytical method recommendations for specific chemicals which the Navy has in-house analytical capability through its three Consolidated Industrial Hygiene Laboratories (CIHLs) located at the Navy Environmental and Preventive Medicine Unit Two (NAVENPVNTMEDU TWO), Norfolk, VA; NAVENPVNTMEDU FIVE, San Diego, CA and NAVENPVNTMEDU SIX, Pearl Harbor, HI. This guide is a concise reference for the industrial hygienist in the proper submission of industrial hygiene, environmental, bulk and biological samples. This guide lists the analyte or substance, the Chemical Abstracts Service Registry Number (CAS #) for the substance, analytical method used by the laboratory in performing the analysis, method's coefficient of variation (CV), limit of detection (LOD), sampling media, recommended air volume, sampling rate, special instructions for the industrial hygienist submitting the sample, and location of laboratory which can analyze the sample. Customers should submit samples to the laboratory located nearest them or most convenient to them. If that laboratory does not have the analytical capability, call the laboratory to verify this fact and choose a laboratory which provides the required service. Since all laboratories are constantly updating their analytical services, always check with the closest laboratory first.

Each CIHL welcomes comments and suggestions regarding its services, additional method development requirements, alternate sampling techniques, and any other input. All questions regarding laboratory service/capability should be addressed to the CIHL which provides the service. Working hours are generally 0730 to 1600 hours Monday through Friday. If the CIHL can't be reached or additional information is required, please call the NAVENPVNTMEDU to which the laboratory reports. All comments concerning the CIHL program management, additions, corrections and changes to this guide, should be addressed to:

Commanding Officer
Attn: CIHL Program Manager
Navy Environmental Health Center
2510 Walmer Avenue
Norfolk, VA 23513-2617

Tel: (757) 462-5526
DSN: 253-5526
FAX: (757) 445-7330
http://www-nehc.med.navy.mil/

LABORATORY ORGANIZATION

BUMEDINST 5450.157, dated 15 June 92, published the functions and tasks of the Navy Environmental Health Center (NAVENVIRHLTHCEN) and its subordinate commands. The mission of the NAVENVIRHLTHCEN, to coordinate and provide centralized support and services to medical activities, afloat and ashore, in areas of occupational health, lead to the formation of the CIHL program. BUMEDINST 5450.157 requires the NAVENPVNTMEDUs to provide, through the CIHLs, specialized qualitative and quantitative analyses of samples to support occupational health and industrial hygiene investigations and assessments.

On 1 October 1989, all Consolidated Industrial Hygiene Laboratories became Departments within the Navy Environmental Health Center's Echelon IV commands. The following information for the three CIHLs is provided:

1- Officer In Charge
Navy Environmental Preventive Medicine Unit Five (NAVENPVNTMEDU FIVE)
Consolidated Industrial Hygiene Laboratory (CIHL)
Naval Station, Box 368143
3235 Albacore Alley
San Diego, CA 92136-5199

Mr. Charles Kubrock, Director of Laboratory
Phone: (619) 556-7070 DSN: 526-7070
FAX: (619) 556-1492
E-mail: ckubrock@nepmu5.med.navy.mil
http://trout.nosc.mil/~nepmu5/

NAVENPVNTMEDU FIVE Phone: (619) 556-7070
DSN: 526-7070 FAX: (619) 556-7071

2- Officer In Charge
Navy Environmental Preventive Medicine Unit Six (NAVENPVNTMEDU SIX)
Consolidated Industrial Hygiene Laboratory (CIHL)
1215 North Road
Pearl Harbor, HI 96860-4477

Dr. Roy M. Ishikawa, CIH, Director of Laboratory
Phone: (808) 474-4428; DSN: 474-4428
FAX: (808) 474-2071
Email: cihl@nepmu6.med.navy.mil
http://nepmu6.med.navy.mil/

NAVENPVNTMEDU SIX Phone: (808) 473-0555
DSN: 473-0555 FAX: (808) 473-2754

3- Officer In Charge
Navy Environmental Preventive Medicine Unit Two (NAVENPVNTMEDU TWO)
Consolidated Industrial Hygiene Laboratory (CIHL)
1887 Powhatan Street
Norfolk, VA 23511-3394

Mr. George Lindsay, CIH, Director of Laboratory
Phone: (757) 444-7671 x 3038; DSN: 564-7671
FAX: (757) 444-1556
E-mail: lindsayg@nepmu2.med.navy.mil
http://www-nehc.med.navy.mil/nepmu2/

NAVENPVNTMEDU TWO Phone: (Same as lab)

GENERAL POLICY

The CIHLs provide analytical support services for samples submitted through the BUMED Industrial Hygiene Offices. The analytical services available at the laboratories are primarily designed for quantitative analyses of occupational health samples and selective environmental samples.

SPECIFIC POLICIES

POLICY ON STANDARD OPERATING PROCEDURES AND LOCAL OPERATING PROCEDURES

Standardization among the laboratories is an essential part of the CIHL programs . A document of Standard Operating Procedures (SOPs), dated June 93, issues quality guidance for the operation and standardization among the CIHLs. Based on this document each CIHL developed its own Local Operating Procedures (LOPs). The LOP (which implements instructions and any laboratory procedural changes) maintains current procedures in use at each laboratory. Historical records are kept of the dates when procedures are implemented and taken out of service.

POLICY ON SAMPLE ACCEPTANCE/REJECTION

Sample submissions, accompanied by the completion of Forms NEHC 5100/13 or 5100/14 (Note: every information category must be completed) by the industrial hygienist, properly preserved as appropriate, and shipped by the proper method (See Sample Packaging and Shipping Requirements Section) will be accepted by the CIHL and analyzed as routine unless the submission is noted "URGENT". Urgent sample must arrive by a one or two day courier service.

If samples are taken incorrectly and/or incomplete paperwork is received, every effort will be made to secure the necessary information to convert the invalid sample into a valid sample. Samples will only be returned to the client when requested by the client. Paperwork may be returned for correct completion, however the samples will remain at the laboratory.

In order to assure a quick laboratory turnaround time, please assure samples are taken according to this guide, shipped appropriately, and the submission Forms are correct and complete.

When samples are received and are not able to be corrected for validity (e.g., fiber counts submitted on PVC filters), the client will be notified by phone, fax or letter in order to determine the disposition of the sample. These samples will be returned to the customer upon the request of the customer.

POLICY ON ANALYTICAL METHODS

Rarely are analytical methods either complete or fully comprehensive to preclude some interpretation, change or modification of the method. NOTE: This is the reason for the CIHL requirement that a LOP manual be available at each CIHL. Most methods are single analyte methods while most samples are multiple contaminants. Most analytical methods used by the CIHLs are taken from the National Institute for Occupational Health (NIOSH) or the Occupational Safety and Health Administration (OSHA) methods. Since OSHA does not required specific analytical methods, unless stated in stressor-specific standards, any method (e.g., ASTM, literature, journal articles, etc.) can be used as long as it meets NIOSH criteria of accuracy within 25% at the 95% confidence level. All NIOSH and OSHA methods in this document are "modified methods". The modification is necessary because of the variance in: analytical columns (types, sizes); desorbing agents; digesting acids/bases; analytical equipment conditions (temperatures, pressures, flow rates). All these modified methods are evaluated and validated for the NIOSH accuracy of 25% at the 95% confidence level by each CIHL, and the method changes are documented as modifications.

POLICY ON COEFFICIENTS OF VARIATIONS

Randomly distributed errors occurring in industrial hygiene sampling are normal and are commonly included in analytical reports by the use of the coefficient of variation (CV). The CV is a useful index of differentiating the true mean of known data points and laboratory reported data. The total CV of the sampling and analytical method is based on a statistical standard normal deviation for 95% two-sided confidence limits. The statistical decision techniques developed by NIOSH and OSHA are implemented in the Navy's use of the CVs. Therefore since the industrial hygienists will seldom receive true exposure results from the labs due to sampling and analytical fluctuations, the CVs for each analyte are reported in the tables so 95% confidence levels may be calculated. Our CIHLs are capable of reporting the same or lower CVs annotated in the official analytical method (the values of which are noted in the Laboratory Sampling Guide Table).

For Time Weighted Average (TWA) sampling, the CV criteria originally adopted by NIOSH of ± 25% accuracy, with 95% confidence limits, is usually cited, but accuracy specifications may vary from one standard to the next. Substances which have Permissible Exposure Levels (PELs), but for which no specific standard has been promulgated, do not have specific accuracy requirements. For these substances, the labs consider the method acceptable (e.g., OSHA, NIOSH, literature cited methods) if it can meet the 25% accuracy requirement with 95% confidence.

POLICY ON ANALYTICAL RESULTS

The CIHLs are reporting air samples results in "total weight per sample" because of the confusion in the interpretation when samples are reported in mg/M^3 (Some clients are using this value as the TWA when the sample did not represent an eight-hour exposure.) Blanks submitted with the samples are also reported in "total weight per sample". The CIHL will notify the client when the blank values are elevated more than normal. It is now the responsibility of the client to take the analytical results and compute TWAs as necessary. If you need assistance, please contact your local industrial hygienist or the CIHL.

POLICY ON LIMIT OF DETECTION

It is not unusual for the Limit of Detection (LOD) of an analyte to vary from day to day. Instrumental conditions and environments vary day to day and this variation often effects the LOD. If you envision detection levels (e.g., a short duration sample) to be a problem, please contact the CIHL performing the analyses. Often the laboratory can modify a method to increase the sensitivity and selectivity; however, the analyst must know your requirements before the performance of the analyses using the standard analytical method.

POLICY ON SPIKED SAMPLES/FIELD SUBMITTED QC SAMPLES

The CIHLs are required by their accreditation through the American Industrial Hygiene Association (AIHA) to have a comprehensive quality control (QC) program which involves, at a minimum: A written QC plan, a designated Quality Control Coordinator (QCC) responsible for the QC program, participation in the Proficiency Analytical Testing (PAT) program for all categories of analytes performed for the client, records which demonstrate the routine introduction of control samples of known content along with samples for analysis, records which demonstrate routine checks, calibrations, maintenance of equipment and instruments are performed to ensure adequate performance, quality control data stored in an accessible manner, routine checks made of procedures and reagents, and interlaboratory, as well as intralaboratory QC.

Occasionally the client may feel uncomfortable with laboratory results and thereby "test" the QC program of the laboratory by administering blind QC samples to the laboratory.

The only recommended method of testing the laboratory is purchasing past PAT rounds from the

AIHA and submitting these as controlled spikes. Literature articles have proven that side by side duplicate monitoring very rarely produces duplicate samples. The use of a duplicate sampling manifold will not produce duplicate samples; however this method of sampling is superior to the use of two independent sampling systems side by side. Contact the AIHA (phone number (703) 849-8888 or FAX (703) 207-3561) for the purchase of PAT metals, solvents, fibers and free silica. PLEASE NOTIFY THE LABORATORY ONCE YOU RECEIVE THE RESULTS OF YOUR QC SAMPLE SO THE LABORATORY MAY DOCUMENT ITS QUALITY CONTROL PROGRAM TO INCLUDE THIS BLIND QC SAMPLE. THIS SAMPLE WILL BE IDENTIFIED AS A TRUE QC BLIND. Also the laboratory will remove the results of this sample from the Database if you have identified the sample as a field sample (e.g., assigned fictitious breathing zone sample information).

Please realize that if there is a quality problem with the CIHLs, the labs want to be the first to know so they can find and resolve the problem. The labs welcome and expect feedback from the clients.

POLICY ON BLANK MEDIA

NIOSH recommends and it is the CIHLs policy that 1) field blanks* should be treated like field samples (corrected for reagent blanks**, media blanks*** and recovery) and 2) sample concentration correction from contaminated field blanks be performed by the person submitting the sample, and NOT THE LABORATORY. (This NIOSH recommendation directed the CIHLs to report all samples and blanks in total contaminants per sample). It is the responsibility of the client (with assistance from the laboratory) to determine what constitutes a contaminated field blank, whether the field blank should be subtracted from the associated sample and whether the sample result should be accepted as valid.

* Field blanks measure the signal contribution of the media plus any contamination which may have occurred during handling, shipping and storage before analysis. Field blanks are taken into the field (workplace), opened and treated just like the field samples except no air is drawn through them.

** Reagent blanks are virgin sampling media that have not been in the workplace.

*** Media blanks measure the signal contribution from the collection media (e.g., the filter, sorbent tube, the impinger solution, etc.)

The nature and number of blank measurements will depend on the method and circumstances. The purpose of all blank measurements is to help prevent errors in identification and quantifying the field samples.

Other CIHL policies on blanks include:
1. All requests for sample analysis will require a minimum of one field blank when OSHA sampling and analytical methods are used, or a minimum of two field blanks when NIOSH sampling and analytical methods are used.

2. When multiple requests from the same source and for the same type of analysis (e.g., metals, benzene, Cr VI, etc.) with multiple corresponding blanks are submitted, the laboratory will analyze and report each sample and each blank submitted.

3. Blanks are analyzed as samples and reported as amount of analyte per sample (e.g., 2 milligrams Cd per filter) or as less than the limit of detection (i.e., <LOD). The LOD appears on the report and will be equal to, or approximately equal to, the analytical method's LOD (See column LOD in the Lab Sampling Guide). It is not unusual for the Limit of Detection (LOD) of an analyte to vary from day to day. Instrumental conditions and environments vary day to day and this variation often effects the LOD. If you envision problems with published detection levels (e.g., a short duration sample), please contact the CIHL performing the analyses. Often the laboratory can modify a method to increase sensitivity or selectivity; however, the analyst must know your requirements before the performance of the analyses using the standard analytical methods.

4. In your computation of sample results, sample values are corrected by subtracting the blank value (or average of blank values when more than one blank is submitted) from each sample value.

5. High blanks - Definition. The majority of blanks for gas chromatographic analyses and metal analyses yield values that are below the LOD for the chosen analyte. For those analytes any blank value which exceeds the LOD can be considered "high". For certain metals (e.g., Fe and Zn), solvents (e.g., benzene) and other analytes (e.g., sulfate) the blank values may exceed the LOD. For these analytes, the lab calculates the mean and the standard deviation of ten or more blanks previously analyzed and uses the mean plus 3 times the standard deviation as the control limit. Any blank which exceeds this control limit will be considered "high". The CIHL will inform you when high blanks are encountered. NOTE: The AIHA considers high blank values to be samples where the reported value (e.g., x micrograms) divided by the volume of sample collected (e.g., y liters) exceeds one-tenth the PEL. This type of contamination may occur in manufacturing or handling of the samples. If possible, additional blanks should be analyzed to ensure sampling medium lot integrity. The industrial hygienist should work closely with the chemists in the CIHLs to determine the source of contamination and to determine whether it is constant. One approach is to decide whether all the samples collected are contaminated equally. If there is a consistent source of contamination, the sample results should be at or above the blank level. If there is no consistency, some unexplained phenomenon has occurred, and the blank should not be subtracted from the analytical results. Bear in mind that subtracting the blank may reduce sample results to lower than what is truly in the workplace. It is generally preferable to be conservative by slightly overestimating the exposures rather than underestimating. It may be useful for the industrial hygienist to prepare control charts for blank values for each type of sample (e.g., lead, zinc, toluene, etc.) in order to determine an acceptable blank value range.

POLICY ON USE OF DISCLAIMERS

The CIHLs recognize field situations when samples cannot be taken according to required sampling methods (e.g., "a once in a lifetime opportunity sample"). In such cases, the laboratory

will usually analyze the sample if taken on an appropriate sampling medium, and report a result accompanied by a disclaimer STAMP. The more common disclaimers on the stamp are:

1- INSUFFICIENT AIR VOLUME- The air volume is less than the amount recommended for this method. Consequently the coefficient of variation (CV) published for the method may not apply. Professional judgement should be used with the interpretation of results.

2- QUESTIONABLE FLOW RATE- The flow rate differs from the recommended method's rate. Therefore, professional judgement should be used in the interpretation of results.

3- INCORRECT SAMPLING MEDIUM- The sample media is not one currently recommended by NIOSH, OSHA or the latest edition of NAVENVIRHLTHCEN's Industrial Hygiene Sampling Guide for CIHLs. Therefore, professional judgment must be used in the interpretation of results.

4- NON-NIOSH/NON-OSHA METHOD- The analytical method is not one currently recommended by NIOSH, OSHA or the latest edition of NAVENVIRHLTHCEN's Industrial Hygiene Sampling Guide for CIHLs. Therefore, professional judgment must be used in the interpretation of results.

5- SHIPPING ERROR- Bulk samples were received in the same shipping package as air samples for the same contaminant. Samples were not preserved or did not arrive at the laboratory within the recommended shipping time. Therefore, professional judgment must be used in the interpretation of results.

6- BLANK(s) NOT SUBMITTED- As required by the sampling and analytical method. Therefore, professional judgment must be used in the interpretation of results.

7- OTHER- Other laboratory specific comments requiring a disclaimer.

QUALITY ASSURANCE (QA)

The three CIHLs are accredited by the American Industrial Hygiene Association (AIHA) which requires participation in all applicable round robin testing programs. The AIHA accreditation program specifies operational guidelines for maintaining satisfactory performance, including qualified personnel, proficiency analytical testing, adequate facilities, quality controls, equipment maintenance, documentation and site audits. In addition to this accreditation program, all laboratories participate in several quality control programs for monitoring daily performance. Both internal and external quality control samples are analyzed to assure accuracy and precision of results. Some of the QA techniques used include replicate analyses, recycles, spiked controls, commercial reference controls, daily instrument calibration, control charts, regression analyses, data review, reagent and media blanks. Each laboratory maintains its own quality control manual, which gives extensive description of the quality assurance program. Please address specific QA questions to the CIHL performing the analytical work.

LAB ANALYTICAL EQUIPMENT

The primary analytical instrumentation in each laboratory consists of gas chromatographs, atomic absorption spectrophotometers (both flame and graphite furnace technologies), ultraviolet/visible spectrophotometers, infrared spectrophotometers, high performance liquid chromatographs, ion specific electrode meters, ion chromatographs, microbalances and microscopes (both phase and polarizing). Inductive coupled plasma (ICP) spectrometers, gas chromatograph/mass spectrophotometer, and an X-Ray Diffractometer are located at various labs. (See page 14 for applications and locations.)

SUBMISSION REQUIREMENTS

SAMPLE SUBMISSION FORM

Air samples must be submitted on Navy Environmental Health Center Forms NEHC 5100/13 and 5100/14. Copies of these form and instructions for completion are provided in the Industrial Hygiene Field Operations Manual, or may be requested from the laboratories.

BIOLOGICAL SAMPLES

Biological samples must be submitted with an accompanying sample submission documentation, preferably a transmittal list containing:

1- Name of medical facility submitting samples

2- Name of person submitting samples

3- Date of submission

4- Name of person sampled (i.e. patient)

5- Sample number [Last four digits of the social security number (SSN) of the patient, or CHCS number]. For example the sample number for J. Doe with SSN of 123-45-6789 might be #Doe 6789.

6- Age of person sampled (required for blood lead samples only)

7- Date sample was collected

8- Name of test requested.

9- Occupational code of patient

10- Patient's command UIC.

Because most medical treatment facilities use a computerized system for medical records, biological samples submitted for blood lead/ZPP and urine mercury may be submitted with a computerized transmittal list. Please refer to section below entitled "ROUTINE BIOLOGICAL SAMPLES" for specific guidance on this transmittal list.

Biological samples for blood lead/ZPP and urine mercury may be submitted on Standard Form 557 (miscellaneous Chemistry Chit). The request must be signed and dated by the submitting MD, RN or PA. All biological samples must be properly packaged and labeled in accordance with Navy, Federal, State and local regulations. It is recommended a commercial express package delivery service be used to transport samples to the CIHL. Please contact the carrier for their shipping and labeling requirements. In general, the samples must be placed in a sealed, waterproof primary container that contains absorbent material sufficient to absorb all possible leakage. The primary container must then be placed in a sealed, secondary container. The secondary container can then be placed in an outer container for shipment. All containers should be adequately cushioned so the samples do not become loose and move during shipment. Freezer packs should be used to keep the samples cold. Do not use ice, and do not freeze the samples. An Etiological Agent/Biomedical Material label must be affixed to the outside of the outer shipping container.

When samples are sent by U.S. Postal Service (USPS), Express Mail Delivery is required. Each package of samples using USPS cannot contain more than a total of 50 milliliters (1.7 ounces) of sample. If more than 50 milliliters of samples (e.g., approximately 7 blood lead samples) are sent to the lab, consider using a commercial express package delivery service. For more information on the shipment of samples, consult U.S. Postal Service Publication 52 entitled "Acceptance of Hazardous, Restricted, or Perishable Material" dated April 1990 and NAVSUPINST 4610.31A entitled "Preparation of Medical Material Requiring Freeze or Chill Environment for Shipment."

SAMPLING REQUIREMENTS

Always review the preferred method of sampling given in this guide and amplified by the appropriate analytical method (e.g., NIOSH or OSHA analytical method manuals, etc.). If the recommendation cannot be followed, contact the laboratory prior to sampling for additional guidance.

The recommended air volumes provided in this guide are usually a range of volumes, with the higher value recommended in the majority of sampling. The lower air volume should only be used when: 1) the exposure may be at an unsafe/unhealthful exposure level such as an exposure exceeding the Time Weighted Average (TWA) value given in the Occupational Safety and Health's Final Rule Limits, 2) the application of a Short Term Exposure Limit (STEL) or a Ceiling value is applicable to the substance, and 3) the operation limits the amount of sampling time. As a general rule, the recommended sampling volumes will allow a detection limit of 10-50% of the TWA.

SAMPLE PACKAGING AND SHIPPING REQUIREMENTS

(See Biological Samples Section for requirements on shipping.)

1. Small sample media such as sorbent tubes and filter cassettes should be bound together (i.e., rubber band) or placed in plastic bags to reduce the possibility of being overlooked or discarded. Sample cassettes and sorbent tubes should NOT be wrapped in tape. Simply affix a legible sample submission number (preferably a preprinted label) to the sample and neatly package it to avoid shipping damage. Never ship air samples and bulk samples in the same shipping package.

2. Submit separate request forms for each type of analyses as follows: Segregate and ship your samples in individual categories of air, bulk, wipe, and biological samples subdivided by metals and organics.

3. Request for analytes should not exceed 3 or 4 organic compounds per sorbent tube. Always check compatibility information on page 13 to ascertain the contaminants collected are compatible with each other and with the analytical procedure. Call the laboratory regarding compatibility when in doubt. Filter samples submitted for metal analyses by atomic absorption spectrophotometry to all CIHL should not contain more than 3 or 4 metals per sample. Since all CIHLs are constantly upgrading analytical instrumentation, check with your lab before submitting a sample for up to ten metals using ICP. Please list the requested metals in order of priority.

4. When requested, ship small quantities of bulk organic solvents in screw cap (Teflon lined) glass vials (e.g., 7.4 milliliter vials, Supelco # 2-3295; or 15 milliliter vials, Supelco #2-3296) to assist the chemist in the analysis of the air samples. Prior to shipment place a permanent ink mark at the level to which the vial is filled. This allows the chemist to determine potential leakage during shipment. Rarely will more than 5.0 milliliters be required. Never ship the bulk and air samples in the same shipping package. Provide information telling the chemist which bulk sample corresponds to the air samples.

5. Most determinations require a minimum of two blanks or one blank for every ten samples submitted, whichever is larger. Remember to always provide 20-30 ml of unexposed impinging solution to be used by the laboratory as reagent blanks and in quality control. The blanks are analyzed by the CIHLs and reported as micrograms (ug) "contaminant" per sample (e.g., per filter, per tube, etc.).

6. All references to water in this guide are deionized or double distilled water.

7. When submitting elemental analysis of hard metal alloys, the bulk sample must be in the form of fine filings, powder or very thin wire.

8. The preferred refrigerant for samples that require refrigeration is freezer packs or frozen gel blocks. Ice may be used for hand-carried lab samples, however the ice must be doubly wrapped in plastic zip-lok bags to avoid leakage. Never use ice when shipping by U.S. Postal Services or commercial delivery services.

9. Shipping containers should be appropriately labeled such as "Fragile", "Refrigerated Material", "Liquid Samples", "Etiologic Agent/Biomedical Material", etc.

10. All samples and materials being packaged, labeled and shipped are governed by Federal, State and local regulations. Compliance with these regulations is the responsibility of the person submitting the samples.

11. In the case of unusually large shipments or high priority samples, please contact the laboratory prior to submission (i.e., as a "heads-up").

SAMPLE TURNAROUND TIMES

Samples will be analyzed on a "first come, first served" basis. Urgent samples will be given special priority and analyzed in one to three working days when the laboratory has been notified in advance of the shipment and when the samples have arrived by special shipment or priority mail. Most routine samples will be analyzed within 10 working days after receipt of the sample. If you have not received your analytical report after 20 working days, please notify the laboratory and check on the status of the samples.

SAMPLE COMPATIBILITY

Since sampling and analytical methods are normally evaluated for a single analyte, care should be given in the interpretation of the methods' CV. When in doubt concerning multi-components samples, take individual samples. The following compounds require special processing for analysis and consequently cannot be analyzed for other compounds in the same sample:

Acetic Acid
Acetonitrile
Acrolein
All cellosolves can be analyzed on same tube, e.g., butyl-, methyl-, etc., however these cellosolves and common organics are not compatible.
All impinger analytes
All isocyanates
Ammonia
Aniline
2-Butanone
Butyl Cellosolve
Camphor
Cellosolve
Chlordane
Chromic Acid or Chromium (VI)
Coal Tar Pitch Volatiles
Cresols
Ethylene glycol

Ethylene oxide
Ethyl ether
Formaldehyde
Hydrazine
Methanol
Methyl Cellosolve
Methyl methacrylate
2-Nitropropane
PCBs
PGDN (Otto Fuel)
Phenol
Pyridine
Tungsten

The following groups of compounds require special processing for analysis. More than one compound within each group can be analyzed in the same sample, but compounds outside the group are incompatible and cannot be analyzed within the same sample:

Group I-	Ethyl Alcohol, Isopropyl Alcohol, and t-Butyl Alcohol
Group II-	n-Butyl Alcohol, s-Butyl Alcohol, iso-Butyl Alcohol and n-Propyl Alcohol
Group III-	Iso-Amyl Alcohol, Diacetone Alcohol, and Cyclohexanol
Group IV-	2-Methoxyethanol, 2-Ethoxyethanol, and 2-Butoxyethanol

LAB SPECIFIC SAMPLES

Each of the CIHLs has declared an area of expertise and it is recommended only these laboratories be used in those specialty areas. The areas and labs are:

Area	Laboratory
Multi-element analysis using Inductive Coupled Plasma (ICP) Spectrometry.	Norfolk San Diego
Advanced High Performance Liquid Chromatography.	San Diego
Gas Chromatography/Mass Spectrometry	Norfolk and San Diego
X-Ray Diffraction	Pearl Harbor

ROUTINE BIOLOGICAL SAMPLES

See page 12 of this Guide for general policies of sampling, packaging, labeling and shipping biologicals.

BLOOD LEAD AND ZINC PROTOPORPHYRIN

Collect in one of the following Becton Dickinson (BD) Vacutainer Systems listed below:

BD Number & Top Color	Description
6488 Brown top	Sodium heparin tube for whole blood (Specifically for blood lead determination)
6527 Dark Blue top	Sodium heparin tube for whole blood (Specifically for trace element studies)
6541 Green top	Sodium heparin tube for plasma (Specifically for plasma studies)
6450 Lavender top	15% EDTA tube for whole blood

Samples must be thoroughly mixed with the heparin or EDTA immediately following collection. Keep samples refrigerated (do not freeze) and hand deliver or ship to the nearest laboratory using priority shipping methods. Use an insulated shipping container, such as a styrofoam shipper. For shipping long distances, freezer packs and express delivery are required.

URINE MERCURY

See page 12 of this Guide for general policies of sampling, packaging, labeling and shipping biologicals.

By BUMED INSTRUCTION 6260.2, dated 7 November 1988, biological monitoring for mercury is no longer required. The potential for personnel exposure to elemental mercury vapor has been greatly reduced by the use of preencapsulated amalgams. Industrial hygiene surveys have shown routine use of preencapsulated amalgams does not result in overexposure of dental personnel to elemental mercury vapor. Therefore, by this BUMED instruction, neither biological sampling or air sampling is specifically required. Occasionally mercury urine may be prescribed by an occupational health professional as circumstances warrant.

Collect sample (first morning void, if possible) in the standard drug screening plastic bottle (NSN 6640-00-165-5778) and add 100 milligrams of potassium persulfate, a preservative. Please do not send more than 20 milliliters of urine per sample. Hand tighten the lid, and place each bottle in a zip-lok bag to contain any leakage during transit to the laboratory. Refrigerate during storage and ship, as soon as possible, in an insulated shipping container, using freezer packs (gel blocks) and express delivery.

IMPINGER MEDIA PREPARATION

Impinger samples should be hand delivered to the laboratory. When this is not possible, the samples should be quantitatively transferred to 22 milliliter glass bottles with Teflon-lined caps (Supelco #2-3297M). Always provide the laboratory with a minimum of 20-30 milliliters of unexposed absorbing solution for a reagent blank.

The impinging solutions are:

Analyte	Impinging Solutions
Ammonia	0.01 N Sulfuric Acid (add 0.28 milliliters conc H_2SO_4 to 1 liter of double distilled or deionized water)
Cyanide	0.1 N Potassium Hydroxide (add 5.6 grams KOH to 1 liter of double distilled water or deionized water)
Formaldehyde	1% Sodium Bisulfite solution (1 gram $NaHSO_3$ in 100 milliliters of double distilled or deionized water)
Hydrazine	0.1 N Hydrochloric Acid (add 8.6 milliliters of conc HCl to 1 liter of double distilled water or deionized water)
Sulfur Dioxide	0.3 M Hydrogen Peroxide (add 17 ml of 30% H_2O_2 to one liter of double distilled or deionized water)

NOTE: 20-30 ml of unexposed reagent is required for reagent blank for all impinging solutions above.

SPECIAL SAMPLING & ANALYSES

BULK SAMPLE SUBMISSIONS

The primary function of any industrial hygiene laboratory is the analysis of breathing zone air samples for contaminants. The CIHLs generally do not perform routine inventory environmental samples (e.g., heavy metals in paint, soil, water) or other bulk sample analysis to determine what components they contain or whether they meet manufacturer's specifications. Information for

the latter is available by writing the manufacturer and requesting product literature and Material Safety Data Sheets. Products for which this information is not available should not be used in the Navy system. Bulk samples should be submitted to the laboratories only under the following conditions:

(1) When the laboratory requests a bulk, as is required in the analytical method (e.g., PCBs, Naphthas, etc.).

(2) When all other means of obtaining information on the chemical composition of the material have been exhausted and prior approval has been given by the laboratory.

CHROMIUM AND CHROMATES

Chromium metal, Cr (II) and Cr (III) compounds are collected on mixed cellulose ester filters (MCEF) and analyzed using atomic absorption spectrometry or ICP. Cr (VI) compounds cannot be determined if sampled on a MCEF.

Chromium in the +6 oxidation state (i.e., Cr (VI), chromic acid, chromium trioxide, all chromates and dichromates) must be collected on PVC filters, with backup pads. If other filter materials are used, the Cr (VI) may be reduced to the Cr (II) or Cr (III) states and thus give a reduced value for Cr (VI). Note: You no longer need to separate the filter from the backup pad prior to shipping the sample. Simply ship the PVC filters in their sampling cassettes.

COAL TAR PITCH VOLATILES (CTPVs)/COKE OVEN EMISSIONS (COEs)/SELECTED POLYNUCLEAR AROMATIC HYDROCARBONS (PNAHs)

The coal tar pitch volatile test is designed for coal tar which has a high concentration of PNAHs. A summary of the test consists of:

1. Dissolving the sample in benzene and evaporating half the benzene mixture to determine how much benzene soluble is present. This part of the test is nonspecific, since almost all organics will dissolve in benzene.
2. To determine whether this material is a hazardous coal tar pitch or asphalt or just organic, a second test is performed on the remaining benzene-soluble fraction. It is analyzed for chrysene and benzo(a)pyrene using OSHA's test for PNAHs.

SAMPLING CTPVs, COEs, AND SELECTED PNAHs

Air samples are collected by drawing known amounts of air through cassettes containing glass fiber filters (GFF). The recommended air volume is 960 liters at 2.0 LPM. Each GFF must be transferred to a separate vial after sampling and the vial sealed with a Teflon-lined cap. Samples must be protected from direct sunlight by wrapping aluminum foil around the vial.

ANALYSIS OF CTPVs, COEs, AND SELECTED PNAHs

The filters are analyzed in the lab by extracting with benzene and gravimetrically determining the benzene-soluble fraction (BSF). If the BSF exceeds the appropriate exposure limit, the rest of the sample is analyzed by high performance liquid chromatography (HPLC) with a fluorescence or ultraviolet detector to determine the presence of selected PNAHs.

INTERPRETATION OF (CTPV) STANDARD

OSHA interprets violation of the CTPV standard as exceeding 0.2 mg/M^3 of benzene-soluble material in air with the lab analysis of the benzene soluble fraction confirming the presence of benzo (a) pyrene and one or more of the five additionally named fused polycyclic hydrocarbons to which the standard refers: anthracene, acridine, pyrene, chrysene and phenanthrene. Sample for CTPV only when the work process involves or potentially involves the residues from heated and distilled tars derived from coal, petroleum, wood, shale oil or other organic materials. Asphalt is specifically exempted from the CTPV standard.

ENVIRONMENTAL SAMPLES

All CIHLs are presently applying for AIHA accreditation in the National Lead Laboratory Accreditation Program (NLLAP) which was established by the U.S. Environmental Protection Agency (EPA) to evaluate and improve the performance of labs conducting analytical testing associated with lead abatement. When your CIHL is accredited it will then accept paint chips and dust wipes for lead analyses. Contact your local CIHL for a start-up date and sampling protocol. Since EPA methods emphasize outside environmental exposures over long periods of time, always contact your CIHL before sampling in a nontraditional, nonoccupational manner.

FIBER COUNTS AND ASBESTOS IDENTIFICATION

These determinations are to be made in the field or at the local activity level. The CIHLs will assist on a case-by-case basis, however, prior approval for accepting these samples must be received from the CIHL before submitting fiber counts and asbestos identification samples to the CIHLs.

Laboratories performing asbestos tests must be proficient in the appropriate proficiency testing programs, (i.e., the Proficiency Analytical Testing (PAT) program for fiber counts and the NAVENVIRHLTHCEN's contractor-operated program for bulk asbestos identification).

POLYCHLOROBIPHENYLS (PCBs)

All CIHLs routinely determine the PCB content in bulk samples as it relates to occupational health, with a lower reporting level of 0.1% or 1000 ppm. The laboratories do not routinely analyze to the EPA standard of 50 ppm for waste disposal purposes.

SILICA (CRYSTALLINE SILICA) ANALYSIS

This method determines silica in respirable and total dust by the OSHA method. The sample filter used is a 5 um PVC filter. SKC Cat No. 225-8-01 (low silica homopolymer PVC), the Omega SILICAL PVC filters, or equivalent low silica homopolymer PVC filter should be used. The respirable dust sample is collected at 1.7 LPM for 800 to 1000 liter of air. A smaller air volume may be used if filter loading greater than 2.0 milligrams is expected.

Bulk samples can be semi-quantitatively analyzed for quartz and cristobalite.

CORRECTION FACTORS

Certain metals (and cyanide) compounds in this guide are reported by the CIHLs "as" the metal ("as" the cyanide). The analytical instrument "sees" only the metal and ignores any other elements that make up the compound sampled. For example, if a sample of iron oxide (Fe_2O_3) is submitted for analysis, the lab reports the results "as Fe". If the analysis indicates a concentration of 10 micrograms iron per sample, this corresponds to a concentration of that amount of iron, not this amount of fume. It is the responsibility of the Industrial Hygienist who took/submitted the sample to convert the results to the correct weight of Fe_2O_3. This is done by dividing the molecular weight (MW) of the compound by the MW of the metal (or cyanide) contained. In this case the following apply:

MW of Fe_2O_3 divided by MW of Fe_2 = 159 divided by 111 = 1.4 (Correction Factor)

Multiplying the Correction Factor by the analytical results gives the correct weight of the contaminant.

1.4 times 10 micrograms iron = 14 micrograms of iron oxide

Correction Factors must be calculated and applied to all metal (and cyanide) compounds in this Guide which are reported "as ....".

SOURCES OF ANALYTICAL SUPPLIES

NOTE: The mention of specific company names and products does not constitute endorsement by the Navy Environmental Health Center.

MANUALS

The NIOSH analytical manuals may be obtained from:
http://www.cdc.gov/niosh/nmam/nmampub.html
Superintendent of Documents
PO Box 371954
Pittsburgh, PA 15250-7954

(202) 512-1800 or fax orders to (202) 512-2250.
[NIOSH Manual of Analytical Methods, fourth edition, 3 parts, Aug 94, DHHS Publication No. 94-113, price approximately $64.]

The OSHA analytical manuals may be obtained from:
http://www.osha-slc.gov/html/dbsearch.html
http://www.osha-slc.gov/dts/sltc/methods/index.html

ACGIH Publications
1330 Kemper Meadow Drive
Cincinnati, OH 45240-1634
Phone: (513) 742-2020 FAX: (513) 742-3355
[Publication #4542 and #4544 and #4545, Price approximately $445.]
http://www.acgih.org/

FILTERS AND SORBENT TUBES

Filters and sorbent tubes may be obtained from a number of sources; however, this manual cites SKC order number for filters and tubes (listed in the SPECIAL INSTRUCTIONS column in the Laboratory Sampling Guide), simply because of convenience and uniformity.

Special attention should be given to SKC Guide to NIOSH/OSHA Air Sampling Standards which is in the SKC Comprehensive Catalog and Air Sampling Guide (Request free copy from SKC.)

SKC, Inc. World Headquarters
863 Valley View Road
Eight Four, PA 15330-9614
Phone: (800) 752-8472 FAX: (800) 752-8476
http://www.skcinc.com

SKC, Gulf Coast
9827 Whithorn Drive
Houston, TX 77095-5027

Phone: (800) 225-1309 FAX: (800)752-4853

SKC, West
P.O. Box 4133
Fullerton, CA 92634-4133
Phone: (800) 752-9378 FAX: (800) 752-1127

Supelco, Inc.
Supelco Park
Bellefonte, PA 16823-0048
Phone: (800) 247-6628 FAX: (800) 447-3044
Technical information only phone: (800) 359-3041
http://www.sigma-aldrich.com

Forest Biomedical
3975 South Main Street
Suite B
Salt Lake City, UT 84107
Phone: (801) 269-1327 FAX: (801) 269-1254

PASSIVE MONITORS

3 M Company
Occupational & Environmental Safety Division
3 M Center, Bldg 224-5S-04
St. Paul, MN 55144-1000
Phone: (800) 752-3623 (Federal System Group orders)
Technical information only phone: (800) 243-4630
http://www.3m.com/market/government/

Landauer, Inc.
2 Science Road
Glenwood, IL 60425-1586
Phone: (708) 755-7000 FAX: (708) 755-7016
http://www.landauerinc.com/about.html

PRINTED SAMPLE NUMBER LABELS

Shamrock Scientific
34 Davis Drive
Bellwood, IL 60104
Phone: (800) 323-0249 FAX: (800) 248-1907
http://www.shamrocklabels.com/

OTHER-SAMPLE COLLECTION BOTTLES, VIALS, AND SUPPLIES

Supelco, Inc.
Supelco Park
Bellefonte, PA 16823-0048
Phone: (800) 247-6628 FAX: (800) 447-3044
Technical information only phone: (800) 359-3041
http://www.sigma-aldrich.com

SKC, Inc. World Headquarters
863 Valley View Road
Eight Four, PA 15330-9614
Phone: (800) 752-8472 FAX: (800) 752-8476
http://www.skcinc.com

Pace Swipes (Used for swipes for metals) are available from:
PALINTEST
21 Kenton Lands Road
P O Box 18733
Erlanger KY 41018
Phone: (800) 835-9629

ABBREVIATIONS USED THROUGHOUT THE GUIDE

N	Norfolk Laboratory
P	Pearl Harbor Laboratory
S	San Diego Laboratory
@	at the concentration of
AMBERSORB	Special type of adsorption tube
Aq	aqueous
BSF	Benzene Soluble Fraction
CAS#	Chemical Abstract Service Registry Number
CIHL	Consolidated Industrial Hygiene Laboratory
CHROMOSORB	Special type of adsorption tube
CT	Charcoal tube (see special instructions for part number)
CV	Coefficient of Variation
FLORISIL	Special type of adsorption tube
FLT	Filter
GFF	Glass fiber filter
HOPCALITE	Special type of adsorption tube for Mercury vapor
ICP	Inductive Coupled Plasma (analyzes multiples of metals per sample)
INHOUSE	laboratory method developed within the organization

L	liters
LPM	liters per minute
LOD	limit of detection (an amount equal to three times the standard deviations of the analytical noise or three times that of a blank, whichever is more appropriate).
0.8 MCEF	Mixed cellulose ester filter, 0.8 micrometer pore size
mg/m^3	milligrams per cubic meter
ml	milliliters
mm	millimeter
MW	Molecular Weight
NIOSH	National Institute for Occupational Safety and Health
ORBO	Adsorption tube trade marked by Supelco
OSHA	Occupational Safety and Health Administration
OVS-2	Special collection device for pesticides, available from Forest Biomedical.
ppm	parts per million
PTFE	Polytetrafluoroethylene filter
PVC	Polyvinyl chloride filter, 5 micrometer pore size
QCC	Quality Control Coordinator
SG	Silica gel sampling tube
ST	Sorbent tube
TENAX	Special type of adsorption tube
um	micrometer
XAD	Special type of adsorption tube

INDUSTRIAL HYGIENE AIR SAMPLE SURVEY FORM NEHC 5100/13
or Lab approved alternative form
(Contact lab for copy of form)

This form is used to record information collected while sampling with air sampling pumps and passive monitors. Analytical information is provided by the laboratory. As many as 5 stressors may be listed on each form, but only 1 worker. Personal breathing zone and area samples may be listed on the same form.

Front Side

TO- The address of the consolidated industrial hygiene laboratory to which the sample is being sent.

FROM- The complete address of the command requesting the sample analysis.

POC- The industrial hygienist to contact in case there are questions concerning the sample(s).

PHONE- The complete commercial and DSN phone numbers of the POC.

FAX- The fax number of the POC.

DATE- The date the samples were collected.

IH UIC- The Unit Identification Code (UIC) of the command providing industrial hygiene support.

ACTIVITY- The name of the command receiving industrial hygiene support.

UIC- The Unit Identification Code of the command receiving industrial hygiene support.

BUILDING/LOCATION- The building or hull number where the samples are being collected.

SHOP/CODE- The name and/or number of the shop where the employee being sampled works.

EMPLOYEE SAMPLED NAME- The complete name of the employee sampled.

SSN/BADGE # -The last 4 digits of the social security number or the badge number of the employee sampled.

JOB TITLE -Job title of individual sampled.

(M)IL OR (C)IV- Is individual sampled military or civilian?

OPERATION- A brief description of the operation performed during the sample period. (e.g., not 'painting' but 'spray painting ship's hull'.)

CODE- The operation code which most closely matches the operation being evaluated. A list of operation codes can be found in the Industrial Hygiene Field Operations Manual (IHFOM) at end of Chapter J.

SHIFT- Number codes - mark the appropriate box on the form.

1 = Day
2 = Evening
3 = Night

FREQUENCY OF OPERATION- Number codes - mark the appropriate box on the form.

1 = Daily
2 = 2-3 Times/Week
3 = Weekly
4 = 2-3 Times/ Month
5 = Monthly
6 = 2-3 Times/Year
7 = Yearly
8 = Special Occasions

DURATION OF OPERATION- Number codes - mark the appropriate box on the form. This is the usual or normal time it takes to perform the operation.

1 = 0 - 15 minutes
2 = 15 - 30 minutes
3 = 30 - 60 minutes
4 = 1 - 2 hours
5 = 2 - 4 hours
6 = 4 - 6 hours
7 = 6 - 8 hours
8 = >8 hours

RESPIRATOR- A description of the respirator being used by the employee, to include manufacturer, model, type of cartridge, etc. If no respirator is in use, state "none."

CODE- The NIOSH approval number for the respirator used.

PPE- A description of any personal protective equipment in use during the sample period.

CODE(S)- The code(s) of the personal protective equipment in use. The list of codes to use can be found in the Industrial Hygiene Field Operations Manual (IH FOM) Appendix 3-C.

PRODUCT USED- A description of the product containing the stressor (e.g., welding rod, spray paint, degreaser, etc.).

VENTILATION- From the following list, select the most closely matching ventilation type:

a. Natural
b. General

c. Small Booth
d. Large Booth, non walk-in
e. Large Booth, walk-in
f. Canopy Hood
g. Glove Box
h. Laboratory Hood
i. Free Hanging
j. Lateral Slot
k. Push-Pull
l. Downdraft
m. Metal working/wood working
n. Low Volume-High Velocity

MEETS SPECS- Based on measurements, does the ventilation meet applicable standards or guide-lines? "Y" for yes; "N" for no; "U" for unknown.

USED- Is the ventilation system used? "Y" for yes; "N" for no.

UNSAMPLED PERIOD- Mark the appropriate box. For Other, please specify conditions.

SAMPLE COLLECTION TYPE- For each sample collected, mark the appropriate box on the form: P (personal) or A (area).

TASK- Further defines the operation.

WORKSITE- The location inside the building or ship where the sample is being collected.

DURATION- The duration of the sample, in minutes (calculated from pump 'on' and 'off' times).

FLOW RATE- The flow rate of the sampling pump, or the equivalent flow rate of the passive monitor, in liters per minute.

VOLUME- The total volume of air collected, in liters.

SAMPLE #- The unique number used to identify the sample.

LABORATORY #- The number used by the lab to identify and track the sample.

STRESSOR/CAS #- The stressor being sampled and the Chemical Abstracts Service (CAS) registry number.

LOD- The limit of detection of the analytical method, to be provided by the laboratory.

RESULTS- This data is provided by the laboratory. The analysis result(s) are expressed as mg per sample or fibers per mm 2 .

CONCENTRATION- Concentration of the stressor(s) in mg/m 3 or fibers/cc. To be calculated by the sample taker.

8 HR TWA- The calculated 8 hour time weighted average(s) of the stressor(s). To be calculated by the sample taker.

DATE RECEIVED- The date the sample was received by the laboratory.

ANALYTICAL METHOD- The method used by the laboratory to analyze the sample.

ANALYSIS PERFORMED BY- The name and signature of the chemist performing the analysis.

DATE ANALYZED- The date the sample was analyzed.

ANALYSIS REVIEWED BY- Name and signature of the reviewing supervisor.

DATE REPORTED- The date the laboratory reported the results.

COMMENTS- Explanatory comments by the chemist about the sample or analysis

Reverse Side

CALIBRATOR- The manufacturer, model, type and serial number of the calibration device.

PRE CAL DATE- The date the sample pump was pre calibrated. Must be the same date as post calibration and sample date unless sampling across the midnight hour.

CALIBRATED BY- The **printed** name and **signature** of the person performing the calibration.

POST CAL DATE- The date the sample pump was post calibrated. Must be the same as the precalibration date and sample date unless sampling across the midnight hour.

PUMP MFG- The manufacturer of the sampling pump or passive monitor.

PUMP MODEL- The model of the sampling pump or passive monitor.

PUMP TYPE- The type of pump or passive monitor

PUMP SERIAL #- The serial number of the pump or passive monitor.

PRE CAL FLOW RATE- The average flow rate during pump precalibration.

POST CAL FLOW RATE- The average flow rate during pump postcalibration.

LOWER FLOW RATE- The lower of the pre and post pump calibration flow rates. This flow rate is to be used when calculating sample volume. The difference between pre and post calibration values should not exceed 5% when calculated by the equation:

$$\% \text{ error} = \frac{(\text{high value} - \text{low value})}{(\text{low value})} \times 100$$

For passive monitors, enter the manufacturer's listed equivalent flow rate.

FIELD SAMPLE ID- The number used to identify the sample in the field.

MEDIA- The type of media used to collect the sample (e.g., MCEF, CT, 3M 3500 OVM).

LOT/TUBE #- The manufacturer's lot or tube number for the media.

EXPIRATION DATE- The expiration date of the media, if any.

TIME OFF- The time the sampling period ended.
TIME ON- The time the sampling period began.

PUMP CHECK(S)- The **time(s)** when the pump was checked to ensure proper operation.

CALCULATIONS- Any calculations associated with the calibration or sample results.

TIME COURSE OF EVENTS/COMMENTS- A detailed chronological description of the operation and any other comments or observations. Anyone reading this TCOE should be able to develop a mental image of what occurred during the operation.

LENGTH OF OPERATION- The actual amount of time the operation was performed on the day the sample was taken. This may or may not correspond to the actual sampling time.

IHT/WPM- The **printed** name and **signature** of the industrial hygiene technician or workplace monitor performing the sampling.

DATE- The date the form was signed.

IH- The **printed** name and **signature** of the industrial hygienist performing the sampling or reviewing the sample form.

DATE- The date the form was signed.

PRIVACY ACT STATEMENT- To be read, signed, and dated by the person being sampled, if required by your Command.

INDUSTRIAL HYGIENE SINGLE STRESSOR AIR SAMPLE SURVEY FORM NEHC 5100/14 or Lab approved alternative form
(Contact lab for copy of form)

This form is used to record in formation collected while sampling with air sampling pumps and passive monitors. Analytical in formation is pro vided by the laboratory. As many as 5 workers may be listed on each form, but only 1 stressor. Personal breathing zone and area samples may be listed on the same form.

Front Side

TO- The address of the consolidated industrial hygiene laboratory to which the sample is being sent.

FROM- The complete address of the command requesting the sample analysis.

POC- The industrial hygienist to contact in case there are questions concerning the sample (s).

PHONE- The complete commercial and DSN phone numbers of the POC.

FAX- The fax number of the POC.

DATE- The date the samples were collected.

IH UIC- The Unit Identification Code (UIC) of the command providing industrial hygiene support.

ACTIVITY- The name of the command receiving industrial hygiene support.

UIC- The Unit Identification Code of the command receiving industrial hygiene support.

BUILDING/LOCATION- The building or hull number where the samples are being collected.

SHOP/CODE- The name and/or number of the shop where the employee being sampled works.

PRODUCT USED- A description of the product containing the stressor (e.g., welding rod, spray paint, degreaser, etc.).

VENTILATION- From the following list, select the most closely matching ventilation type:

a. Natural
b. General
c. Small Booth
d. Large Booth, non walk- in
e. Large Booth, walk- in
f. Canopy Hood
g. Glove Box

h. Laboratory Hood
i. Free Hanging
j. Lateral Slot
k. Push-Pull
l. Down draft
m. Metal working/wood working
n. Low Volume- High Velocity

MEETS SPECS- Based on measurements, does the ventilation meet applicable standards or guidelines? "Y" for yes; "N" for no; "U" for unknown.

USED- Is the ventilation system used? "Y" for yes; "N" for no.

UNSAMPLED PERIOD- Mark the appropriate box. For Other, please specify conditions.

SHIFT- Number codes. Mark the appropriate box on the form.

1 = Day
2 = Evening
3 = Night

FREQUENCY OF OPERATION- Number codes. Mark the appropriate box on the form.

1 = Daily
2 = 2-3 Times/Week
3 = Weekly
4 = 2-3 Times/Month
5 = Monthly
6 = 2-3 Times/Year
7 = Yearly
8 = Special Occasions

DURATION OF OPERATION- Number codes. Mark the appropriate box on the form. This is the usual or normal time it takes to perform the operation.

1 = 0 - 15 minutes
2 = 15 - 30 minutes
3 = 30 - 60 minutes
4 = 1 - 2 hours
5 = 2 - 4 hours
6 = 4 - 6 hours
7 = 6 - 8 hours
8 = >8 hours

M OR C- Is/are the individual(s) being sampled military or civilian? Mark the appropriate Box (es). To be marked only if this is a personal sample.

P OR A- Is/are the sample(s) collected as personal (P) or area (A)? Mark the appropriate

Box (es). For area sample(s) the M or C box (es) should not be marked.

EMPLOYEE NAME- The complete name of the employee sampled.

SSN/BADGE #- The last 4 digits of the social security number or the badge number of the employee sampled.

TASK- Further defines the operation.

WORKSITE- The location inside the building or ship where the samples are being collected.

JOB TITLE- Job title of individual sampled.

OPERATION- A brief description of the operation performed during the sample period (e.g. not 'painting' but 'spray painting ship's hull'.).

CODE- The operation code which most closely matches the operation being evaluated. A list of operation codes can be found in the Industrial Hygiene Field Operations Manual (IHFOM) at end of Chapter J.

RESPIRATOR- A description of the respirator being used by the employee, to include manufacturer, model, type of cartridge, etc. If no respirator is in use, state “none.”

CODE- The NIOSH approval number for the respirator used.

PPE- A description of any personal protective equipment in use during the sample period.

CODE(S)- The code(s) of the personal protective equipment in use. A list of codes to be used can be found in the Industrial Hygiene Field Operations Manual, Appendix 3-C.

STRESSOR- The stressor being sampled. A list of stressors with exposure standards is in the IHIMS manual.

CAS#- The Chemical Abstracts Service (CAS) registry number.

SAMPLE #- The unique number used to identify the sample.

LABORATORY#- The number used by the lab to identify and track the sample.

SAMPLE DURATION- The duration of the sample, in minutes (calculated from pump 'on' and 'off' times).

FLOW RATE- The flow rate of the sampling pump, or the equivalent flow rate of the passive monitor, in liters per minute.

VOLUME- The total volume of air collected, in liters.

RESULTS This data is provided by the laboratory. The result(s) of analysis are expressed as mg per sample or fibers per mm 2 .

CONCENTRATION- The concentration of the stressor(s) in mg/m 3 or fibers/cc. **To be calculated by the sample taker.**

8-HR TWA- The calculated 8-hour time weighted aver-age (s) of the stressor(s). **To be calculated by the sample taker.**

DATE RECEIVED- The date the sample was received by the laboratory.

ANALYTICAL METHOD- The method used by the laboratory to analyze the sample.

LOD- The limit of detection of the analytical method, to be provided by the laboratory.

ANALYSIS PERFORMED BY- The name and signature of the chemist performing the analysis.

DATE ANALYZED- The date the sample was analyzed.

ANALYSIS REVIEWED BY- Name and signature of the reviewing supervisor.

DATE REPORTED- The date the laboratory reported the results.

COMMENTS- Explanatory comments by the chemist about the sample or analysis.

Reverse Side

CALIBRATOR- The manufacturer, model, type and serial number of the calibration device.

PRE CAL DATE- The date the sample pumps were pre calibrated. Must be the same date as post calibration and sample date unless sampling across the midnight hour.

CALIBRATED BY- The **printed** name and **signature** of the person performing the calibration.

POST CAL DATE- The date the pumps were post calibrated. Must be the same as the pre calibration and sample date unless sampling across the midnight hour.

PUMP MFG- The manufacturer of the sampling pump or passive monitor.

PUMP MODEL- The model number of the sampling pump or passive monitor.

PUMP TYPE- The type of air sampling pump (i.e., multi-flow, high flow, etc.).

PUMP SERIAL #- The serial number of the sampling pump or passive monitor.

PRE CAL FLOW RATE- The average flow rate during pre calibration.

POST CAL FLOW RATE- The average flow rate during post calibration.

LOWER FLOW RATE- The lower of the pre and post calibration flow rates. This flow rate is to be used when calculating sample volume. The difference between pre and post calibration values should not exceed 5% when calculated by the equation:

$$\% \textit{ error} = \textit{(high value - low value)/(low value)} \textit{ x } 100$$

For passive monitors, enter the manufacturer's listed equivalent flow rate.

FIELD ID #- The number used to identify the sample in the field.

MEDIA- The type of media used to collect the sample (e.g., MCEF, CT, 3M 3500 OVM).

LOT/TUBE #- The manufacturer's lot or tube number for the media.

EXPIRATION DATE- The expiration date of the media, if any.

TIME OFF- The time the sampling period ended.

TIME ON- The time the sampling period began.

PUMP CHECK(S)- The **time(s)** when the pump was checked to ensure proper operation.

CALCULATIONS- Any calculations associated with the calibration or sample results.

TIME COURSE OF EVENTS/COMMENTS- A **detailed** chronological description of the operation and any other comments or observations. Anyone reading the TCOE should be able to develop a mental image of what occurred during the operation.

LENGTH OF OPERATION- The actual amount of time the operation was performed on the day the sample was taken. This may or may not correspond to the actual sampling time.

IHT/WPM- The **printed** name and **signature** of the industrial hygiene technician or workplace monitor performing the sampling.

DATE- The date the form was signed.

IH- The **printed** name and **signature** of the industrial hygienist performing the sampling or reviewing the sample form.

DATE- The date the form was signed.

PRIVACY ACT STATEMENT- To be read, signed, and dated by the person(s) being sampled, if required by your Command.

ID #	CHEMICAL	CAS #	METHOD	CV	LOD (ug)	SAMPLING MEDIA	SAMPLE VOLUME (liter)	SAMPLING RATE (lpm)	INSTRUCTIONS	LAB
1	ACETIC ACID	64197	NIOSH 1603	0.058	10	CT (100/50)	20L @ 10 ppm - 300L	0.01-1.0	ST 226-01 Not compatible with other organics.	N
2	ACETIC ACID	64197	OSHA 186SG	0.11	10	CT (100/50)	48L MAX 20L @ 10ppm - 300L	0.2	ST 226-09 Not compatible with other organics.	P S
3	ACETIC ACID	64197	NIOSH 1603 (Modified)	0.06	20	SG (400/200)	100L	0.2-0.5	ST 226-10-03	S
4	ACETONE	67641	NIOSH 1300	0.082	20	CT (100/50)	0.5L-3L	0.01-0.2	ST 226-01	ALL
5	ACETONE	67641	OSHA 69	0.082	20	ANASORB CMS (150/75)	3L	0.05	ST 226-121	N
6	ACETONITRILE	75058	NIOSH 1606	0.072	10	CT (400/200)	3L @ 70 mg/m3 - 25L	0.01-0.2	ST 226-24 Not compatible with other organics.	N S
7	ACIDS, INORGANIC (H2SO4)	7664939	NIOSH 7903	0.089	0.9	SG (400/200) prewashed, or ORBO 53	3L-100L	0.2-0.5	ST 226-10-03 (may contain high sulfate) Supelco 2-0265M is preferred; send blanks	ALL
8	ACIDS, INORGANIC (H3PO4)	7664382	NIOSH 7903	0.096	2	SG (400/200) prewashed, or ORBO 53	3L-100L	0.2-0.5	ST 226-10-03 (may contain high sulfate) Supelco 2-0265M is preferred; send blanks	ALL
9	ACIDS, INORGANIC (H3PO4)	7664382	OSHA 113	0.067	1	0.8 um MCEF	960 L	2 LPM	FLT 225-5 Remove filter and ship in glass vial; send blanks	N
10	ACIDS, INORGANIC (HBr)	10035106	NIOSH 7903	0.074	0.9	SG (400/200) prewashed, or ORBO 53	3L-100L	0.2-0.5	ST 226-10-03 (may contain high sulfate) Supelco 2-0265M is preferred; send blanks	ALL
11	ACIDS, INORGANIC (HCl)	7647010	NIOSH 7903	0.059	0.6	SG (400/200) prewashed, or ORBO 53	3L-100L	0.2-0.5	ST 226-10-03 (may contain high sulfate) Supelco 2-0265M is preferred; send blanks	ALL
12	ACIDS, INORGANIC (HF)	7664393	NIOSH 7903	0.12	0.7	SG (400/200) prewashed, or ORBO 53	3L-100L	0.2-0.5	ST 226-10-03 (may contain high sulfate) Supelco 2-0265M is preferred; send blanks	ALL
13	ACIDS, INORGANIC (HNO3)	7697372	NIOSH 7903	0.085	0.7	SG (400/200) prewashed, or ORBO 53	3L-100L	0.2-0.5	ST 226-10-03 (may contain high sulfate) Supelco 2-0265M is preferred; send blanks	ALL
14	ACROLEIN	107028	OSHA 52	0.071	2	XAD-2 COATED (150/75)	3L-48L	0.1-0.2	ST 226-117 or ORBO 24 Not compatible with other organics.	P
15	ACRYLAMIDE	79061	OSHA 21	0.071	0.46	GFF & SG	120L	1	Supelco 2-0229 & 2-3376	N
16	ACRYLONITRILE	107131	NIOSH 1604	0.06	1	CT (100/50)	3.5L @ 2ppm - 20L	0.01-0.2	ST 226-01 Not compatible with other organics.	N
17	ALDRIN	309002	NIOSH 5502	0.092	3	GFF & BUBBLER	18L @ 0.25 mg/m3 – 40L	0.2-1.0	FLT 225-7 15ml ISOOCTANE, Ship in glass vial (i.e. Supelco #2-3297)	N
18	ALUMINUM and compounds as (Al) except Al2O3	7429905	NIOSH 7013	0.07	2	0.8 um MCEF	10L @ 5 mg/m3 – 4000L	1-3 LPM	FLT 225-5	P
19	ALUMINUM and compounds as (Al) except Al2O3	7429905	NIOSH 7300 & OSHA 125	0.08 10 for Norfolk	1	0.8 um MCEF	100L	1-4LPM if Lab uses NIOSH method; 2 if OSHA.	FLT 225-5	ALL
20	AMINOETHANOL (Ethanolamine)	141435	OSHA 60	0.056	5	XAD-2 with 1-Napthylisothiocyanate	10L for TWA 1.5 L for STEL	0.1	ST 226-30-18	S
21	AMMONIA	7664417	OSHA 188	0.05	25	ACID TREATED CARBON BEADS	24L	0.1	ST 226-29 or Supelco ORBO 77	N S
22	AMMONIA	7664417	NIOSH 205	0.1	5	IMPINGER (0.01 N sulfuric acid)	30L	1-2 LPM	IMPINGE IN 0.01N Sulfuric Acid	P
23	AMMONIA	7664417	NIOSH S347	0.062	5	SG (200/100) Acid treated	30L	0.1-0.2	ST 226-10-06	P
24	AMYL ACETATE (iso-isomer)	123922	NIOSH 1450 & OSHA 7	0.056	2.6	CT (100/50)	1L-10L	0.01-0.2	ST 226-01	ALL
25	AMYL ACETATE (n-isomer)	628637	NIOSH 1450 & OSHA 7	0.051	2.6	CT (100/50)	1L-10L	0.01-0.2	ST 226-01	ALL
26	AMYL ACETATE (sec-isomer)	626380	NIOSH 1450 & OSHA 7	0.071	3.3	CT (100/50)	1L-10L	0.01-0.2	ST 226-01	ALL

ID #	CHEMICAL	CAS #	METHOD	CV	LOD (ug)	SAMPLING MEDIA	SAMPLE VOLUME (liter)	SAMPLING RATE (lpm)	INSTRUCTIONS	LAB
27	AMYL ALCOHOL (iso-isomer)	123513	NIOSH 1402	0.077	10	CT (100/50)	1L-10L	0.01-0.2	ST 226-01 Not compatible with other organics.	ALL
28	ANILINE	62533	NIOSH 2002	0.06	10	SG (150/75)	20L	0.4	ST 226-10	N
29	ANTIMONY (Sb)	7440360	OSHA 125	0.064	1	0.8 um MCEF	480L	2	FLT 225-5	N S
30	ANTIMONY (Sb)	7440360	OSHA 121	0.059	1	0.8 um MCEF	480L	1-2 LPM	FLT 225-5	P
32	ARSENIC and compounds as As	7440382	NIOSH 7900	0.12	0.02	0.8 um MCEF	30L @ 0.002 mg/m3 - 1000L	1-3 LPM	FLT 225-5 Particulate only	P
33	ARSENIC and compounds as As	7440382	NIOSH 7300 & OSHA 125	0.1	1	0.8 um MCEF	30L-2000L	1-4LPM if Lab uses NIOSH method; 2 if OSHA.	FLT 225-5	N S
34	ASBESTOS IDENTIFICATION OF BULK MATERIAL		NIOSH 9002	call lab	< 1.0%	BULK, CLEAR 4"X4" ZIPLOK	<10 Grams, 2x2x2 cm		4"x4" Zip-lok bag 8105-00-837-7753, Asbestos ID is to be done locally (Must be rated proficient).	in field
35	ASPHALT	8052424	OSHA 58 (Modified)	0.08	0.2	PTFE	960L	2	FLT 225-17-07 Ship immediately in Al foil wrapped glass vial.	N
36	BAYGON (propoxur)	114261	OSHA IMIS0318	0.061	1	Special Collection Device	480L	1	ST 226-30-16 or OVS-2 from Forrest Biomedical	P
37	BENOMYL (BENLATE)		IN-HOUSE			OVS-2	20 – 60 L	1	ST 226-30-16 or OVS from Forrest Biomedical	P
38	BENZENE	71432	NIOSH 1500/1501 & OSHA 7	0.059	10	CT (100/50)	2L-30L	0.01-0.2	ST 226-01	ALL
39	BENZENE SOLUBLES		OSHA 58 (Modified)	0.08	0.2	PTFE	960L	2	FLT 225-17-07 Ship immediately in Al foil wrapped glass vial.	N
40	BENZY ALCOHOL	100516	OSHA IN-HOUSE	0.097	10	XAD-7	24 L	0.2 LPM	ST 226-95	N
41	BERYLLIUM and compounds as Be	7440417	NIOSH 7300 & OSHA 125	0.06	0.05	0.8 um MCEF	250L	1-4LPM if Lab uses NIOSH method; 2 if OSHA.	FLT 225-5	N S
42	BERYLLIUM and compounds as Be	7440417	NIOSH 7102	0.064	0.005	0.8 um MCEF	25L @ 0.002 mg/m3 – 1000L	1-4 LPM	FLT 225-5	P
43	BISPHENOL A	80057	NIOSH 333	0.053	0.4	GFF	180L	1	FLT-225-7	N
44	BROMACIL	314409	OSHA IN-HOUSE	0.1	10	MI containing ethylene glycol	20 – 50 L	1	MI; send 50 ml of ethylene glycol for use as blanks and preparing standards.	P
45	BROMINE	7726956	NIOSH 6011	0.069	1.6	Silver membrane filter	8L-360L	0.3-1.0	FLT 225-1802	N
46	BROMOFORM (tribromomethane)	75252	NIOSH 1003	0.043	10	CT (100/50)	4L @ 0.5 ppm – 70L	0.01-0.2	ST 226-01	N S
47	BROMOTRI-FLUOROMETHANE (R 13B1)	75638	NIOSH 1017	0.065	50	Two CT (400/200 + 100/50)	5L	0.01-0.05	ST 226-09 & 226-01 Sample in series, disconnect and cap each for shipment	N
48	BUTADIENE (1,3 isomer)	106990	OSHA 56	0.065	1	CT Treated	3L	0.05	ST 226-73	N

ID #	CHEMICAL	CAS #	METHOD	CV	LOD (ug)	SAMPLING MEDIA	SAMPLE VOLUME (liter)	SAMPLING RATE (lpm)	INSTRUCTIONS	LAB
49	BUTANONE (methyl ethyl ketone or MEK)	78933	NIOSH 2500 or OSHA 84	0.069	4	ORBO 90 (160/80)	1L-12L	0.01-0.2	Supelco #2-0358M, ST 226-81A or ST 226-121. Not compatible with other organics.	ALL
50	BUTANONE (methyl ethyl ketone or MEK)	78933	OSHA 16	0.059	12	Two SG (150/75)	1L-12L	0.1	ST 226-10 Sample in series, separate, cap each and ship to lab. Not compatible with other organics.	N S
51	BUTOXYETHANOL (butyl cellosolve)	111762	NIOSH 1403 & OSHA 7	0.06	20	CT (100/50)	1L-10L	0.01-0.05	ST 226-01 Not compatible with other organics. Store in FREEZER.	ALL
52	BUTYL ACETATE (iso-isomer)	110190	NIOSH 1450	0.065	2	CT (100/50)	1L-10L	0.01-0.2	ST 226-01	ALL
53	BUTYL ACETATE (n-isomer)	123864	NIOSH 1450	0.069	2	CT (100/50)	1L-10L	0.01-0.2	ST 226-01	ALL
54	BUTYL ACETATE (sec-isomer)	105464	NIOSH 1450	0.054	2	CT (100/50)	1L-10L	0.01-0.2	ST 226-01	ALL
55	BUTYL ACETATE (tert-isomer)	540885	NIOSH 1450	0.091	2	CT (100/50)	1L-10L	0.01-0.2	ST 226-01	ALL
56	BUTYL ALCOHOL (iso-isomer)	78831	NIOSH 1401 & OSHA 7	0.073	10	CT (100/50)	1L-10L	0.01-0.2	ST 226-01 Not compatible with other organics. Store in FREEZER.	ALL
57	BUTYL ALCOHOL (n-isomer)	71363	NIOSH 1401 & OSHA 7	0.065	10	CT (100/50)	1L-10L	0.01-0.2	ST 226-01 Not compatible with other organics. Store in FREEZER.	ALL
58	BUTYL ALCOHOL (sec-isomer)	78922	NIOSH 1401 & OSHA 7	0.066	10	CT (100/50)	1L-10L	0.01-0.2	ST 226-01 Not compatible with other organics. Store in FREEZER.	ALL
59	BUTYL ALCOHOL (tert-isomer)	75650	NIOSH 1400 & OSHA 7	0.075	10	CT (100/50)	0.5L-10L	0.01-0.2	ST 226-01 Not compatible with other organics. Refrigerate shipment.	ALL
60	BUTYL GLYCIDYL ETHER (BGE)	2426086	NIOSH S81 & OSHA 7	0.074	300	CT (100/50)	10L	0.2	ST 226-01	ALL
61	CADMIUM and compounds as Cd	7440439	NIOSH 7300 & OSHA 125	0.064	0.05	0.8 um MCEF	200L	1-4LPM if Lab uses NIOSH method; 2 if OSHA.	FLT 225-5	ALL
63	CADMIUM and compounds as Cd	7440439	NIOSH 7048	0.073	0.05	0.8 um MCEF	50L @ 0.05 mg/m3 – 1500L	1-3 LPM	FLT 225-5	P
64	CALCIUM and compounds as Ca	7440702	NIOSH 7300 & OSHA 125	0.063	1	0.8 um MCEF	50L	1-4LPM if Lab uses NIOSH method; 2 if OSHA.	FLT 225-5	ALL
65	CALCIUM and compounds as Ca	7440702	NIOSH 7020	0.063	1	0.8 um MCEF	20L @ 5 mg/m3 – 400L	1-3 LPM	FLT 225-5	P
66	CAMPHOR (SYNTHETC)	76222	NIOSH 1301	0.074	50	CT (100/50)	1L-25L	0.01-0.2	ST 226-01 Not compatible with other organics.	N S
67	CARBARYL (Sevin)	632522	OSHA 63	0.063	1.7	Special Collection Device	60L	1	ST 226-30-16 or OVS-2 from Forrest Biomedical	P
68	CARBON BLACK (NONSPECIFIC)	1333864	NIOSH 5000	0.056	0.03	TARED 5um PVC or dual MCEF	85L @ 3.5 mg/m3 – 570L	1.5-2	FLT 225-8-01 or FLT 225-8202 (matched wt) Analysis performed in field.	in field
69	CARBON DISULFIDE	75150	NIOSH 1600	0.059	20	CT (100/50)	2L@ 100 ppm – 25L	0.01-0.2	ST 226-01	P
70	CARBON TETRACHLORIDE	56235	NIOSH 1003 & OSHA 7	0.092	10	CT (100/50)	3L @ 10 ppm – 150L	0.01-0.2	ST 226-01	ALL
71	CHLORDANE	57749	OSHA 67	0.089	30	Special Collection Device	480L	1	ST 226-30-16 or OVS-2 from Forrest Biomedical	N P

ID #	CHEMICAL	CAS #	METHOD	CV	LOD (ug)	SAMPLING MEDIA	SAMPLE VOLUME (liter)	SAMPLING RATE (lpm)	INSTRUCTIONS	LAB
72	CHLORINE	7782505	NIOSH 6011	0.075	0.6	Silver membrane filter	2L-90L	1	FLT 225-1802	N
73	CHLOROBENZENE	108907	NIOSH 1003 & OSHA 7	0.056	10	CT (100/50)	1.5L @ 75ppm – 40L	0.01-0.2	ST 226-01	P S
74	CHLOROBENYLID-ENE MALONO-NITRILE (CS GAS)	2698411	NIOSH 304	0.105	0.5	PTFE PLUS TENAX-GC	15 – 90 L	< 1.5 LPM	FLT 225-17-01; ST 226-35-07 CS Gas is the ortho isomer of CHLOROBENYLID-ENE MALONO-NITRILE	P
75	CHLOROFORM (trichloromethane)	67663	NIOSH 1003 & OSHA 7	0.057	20	CT (100/50)	1L @ 50 ppm - 50L	0.01-0.2	ST 226-01	ALL
76	CHLOROTRI-FLUOROMETHANE (R 13)	75729	NIOSH S111	0.064	85	Two CT (400/200)	3L	0.01-0.05	ST 226-09 Sample with tubes in series, separate, cap each, ship to lab.	N
77	CHLORPYRIFOS (Dursban)	2921882	OSHA 62	0.058	0.1	Special Collection Device	480L	1	ST 226-30-16 or OVS-2 from Forrest Biomedical	N P
78	CHROMIUM and compounds as total Cr	7440473	NIOSH 7300 & OSHA 125	0.073	1	0.8 um MCEF	100L	1-4LPM if Lab uses NIOSH method; 2 if OSHA.	FLT 225-5	ALL
79	CHROMIUM and compounds as total Cr	7440473	NIOSH 7024	0.085	1	0.8 um MCEF	10L @ 0.5mg/m3 – 1000L	1-3 LPM	FLT 225-5	P
80	CHROMIUM VI (hexavalent Chromic Acid, CrO3)	7738945	OSHA 215	0.059	0.01	5 um PVC	960L @ 0.11 ug/m3 full shift sample. 30L for 15 min ceiling.	1-4 LPM	FLT 225-806	ALL
81	COAL DUST	68131748	NIOSH 7500	0.13	10	Tared PVC + CYCLONE	400L @ 0.05 mg/m3 – 1000L	1.7	FLT 225-8-01 Sample must be respirable fraction.	P
82	COAL TAR PITCH VOLATILES	65996932	OSHA 58 (Modified)	0.08	0.2	PTFE	960L	2	FLT 225-17-07 Ship immediately in Al foil wrapped glass vial.	N
83	COBALT and compounds as Co	7440484	NIOSH 7300 & OSHA 125	0.07	1	0.8 um MCEF	100L	1-4LPM if Lab uses NIOSH method; 2 if OSHA.	FLT 225-5	ALL
84	COBALT and compounds as Co	7440484	NIOSH 7027	0.071	0.6	0.8 um MCEF	30L @ 0.1mg/m3 – 1500L	1-3 LPM	FLT 225-5	P
85	COPPER DUST / FUME as Cu	7440508	NIOSH 7300 & OSHA 125	0.067	1	0.8 um MCEF	100L	1-4LPM if Lab uses NIOSH method; 2 if OSHA.	FLT 225-5	ALL
86	COPPER DUST / FUME as Cu	7440508	NIOSH 7029	0.051	0.5	0.8 um MCEF	50L @ 0.1 mg/m m3 – 1500L	1-3 LPM	FLT 225-5	P
87	CRESOL (ALL ISOMERS)	1319773	NIOSH 2546 & OSHA 32	0.054	26	XAD-7 (100/50)	1.0L-24 L	0.01-0.1	ST 226-95	ALL
88	CUMENE (isopropyl benzene)	98828	NIOSH 1501 & OSHA 7	0.06	10	CT (100/50)	10L-30L	0.01-0.2	ST 226-01	N S
89	CYANIDES (AEROSOL / GAS) as CN		NIOSH 7904	0.103	2.5	0.8 um PVC + BUBBLER	10L @ 5 mg/m3 – 180L	0.5-1.0	FLT 225-5, 10 ml 0.1N KOH Ship in glass vial (Supelco#2-3297)	S P
90	CYCLOHEXANE	110827	NIOSH 1500 & OSHA 7	0.06	10	CT (100/50)	2.5L-5L	0.01-0.2	ST 226-01	ALL

ID #	CHEMICAL	CAS #	METHOD	CV	LOD (ug)	SAMPLING MEDIA	SAMPLE VOLUME (liter)	SAMPLING RATE (lpm)	INSTRUCTIONS	LAB
91	CYCLOHEXANOL	108930	NIOSH 1402 & OSHA 7	0.08	10	CT (100/50)	1L-10L	0.01-0.2	ST 226-01 Not compatible with other organics.	P S
92	CYCLOHEXANONE	108941	OSHA 1	0.052	10	CHROMOSORB 106 (100/50)	10L	0.05	ST 226-110	N S
93	CYCLOHEXANONE	108941	NIOSH 1300	0.063	10	CT (100/50)	1L-10L	0.01-0.2	ST 226-01	P S
94	CYCLOHEXENE	110838	NIOSH 1500 & OSHA 7	0.073	10	CT (100/50)	5L-7L	0.01-0.2	ST 226-01	S
95	CYCLOHEXYLAMIN E	108918	OSHA in house	0.1	2	COATED XAD-7	10L	0.1	ST 226-98	N
96	CYCLONITE (RDX)	121824	OSHA in house	0.1	1	GFF	960L	2	FLT 225-7	N
97	DDVP (Dichlorovos)	62737	OSHA 62	0.053	0.7	Special Collection Device	480L	1	ST 226-30-16 or OVS-2 from Forrest Biomedical	N
98	DESFLURANE	57041675	OSHA 106	0.056	0.5	ANASORB 747 (140/70)	3 L	0.05	ST 226-81A Store samples at reduced temperatures.	S
99	DIACETONE ALCOHOL	123422	NIOSH 1402 & OSHA 7	0.1	10	CT (100/50)	1L-10L	0.01-0.2	ST 226-01 Not compatible with other organics.	ALL
100	DIAZINON	333415	OSHA 62	0.053	0.2	Special Collection Device	480L	1	ST 226-30-16 or OVS-2 from Forrest Biomedical	N P
101	DIBUTYL PHTHALATE	84742	OSHA 104	0.056	5.0	OVS-TENAX	240 L	1	ST 226-56	S
102	DICHLORO-BENZENE (ortho-isomer)	95501	NIOSH 1003 & OSHA 7	0.068	10	CT (100/50)	1L @ 50 ppm - 60L	0.01-0.2	ST 226-01	ALL
103	DICHLORODI-FLUOROMETHANE (R 12)	75718	NIOSH 1018	0.064	50	Two CT (400/200 + 100/50)	1L @ 1000 ppm – 4L	0.01-0.5	ST 226-09 & 226-01 Sample with tubes in series, separate, cap each, ship to lab.	ALL
104	DICHLOROETHANE (1,1 isomer)	75343	NIOSH 1003 & OSHA 7	0.057	10	CT (100/50)	0.5L @ 100 ppm – 15L	0.01-0.2	ST 226-01	S
105	DICHLOROETHANE (1,2 isomer) (Ethylene dichloride)	107062	NIOSH 1003 & OSHA 7	0.079	10	CT (100/50)	1L @ 50 ppm - 50L	0.01-0.2	ST 226-01	ALL
106	DICHLORO-ETHYLENE (1,2 isomer)	540590	NIOSH 1003 & OSHA 7	0.052	10	CT (100/50)	0.2L @ 200 ppm – 5L	0.01-0.2	ST 226-01	S
107	DIELDRIN	60571	NIOSH S283	0.086	0.1	GFF	180L	0.1-1.5	FLT 225-7 Ship in glass vial (Supelco#2-3297)	N P
108	DIESEL FUEL MARINE		NIOSH 1550	0.1	1	GFF PLUS LARGE CT	15 – 100 L	1	FLT 225-7, ST 226-09	P
109	DIETHYLENE TRIAMINE	111400	OSHA 60	0.08	0.16	XAD-2 (270/140)	10L	0.1	ST 226-30-18	S
110	DIISOBUTYL KETONE	108838	NIOSH 1300 & OSHA 7	0.082	10	CT (100/50)	1L-10L	0.01-0.2	ST 226-01	S
111	DIMETHYFORM-AMIDE (DMF)	68122	NIOSH 2004	0.056	10	SG (150/75)	15L @ 30 mg/m3 – 80L	0.01-1.0	ST 226-10	N S
112	DIMETHYL-ACETAMIDE	127195	NIOSH 2004	0.067	10	SG (150/75)	15L-80 L	0.01-1.0	ST 226-10	N
113	DIOCTYL PHTHALATE	117840	NIOSH 5020	0.057	10	MCEF	6L-200 L	1-3 LPM	FLT 225-5	N

ID #	CHEMICAL	CAS #	METHOD	CV	LOD (ug)	SAMPLING MEDIA	SAMPLE VOLUME (liter)	SAMPLING RATE (lpm)	INSTRUCTIONS	LAB
114	DIOCTYL PHTHALATE	117840	OSHA 104	0.1	10	OVS + TENAX	240L	1	ST 226-56	N
115	DIOXANE (1,4 Diethylene dioxide)	123911	NIOSH 1602 & OSHA 7	0.054	10	CT (100/50)	0.5L @ 100 ppm – 15L	0.01-0.2	ST 226-01	ALL
116	DIPROPYLENE GLYCOL METHYL ETHER	34590948	OSHA 7	0.1	10	CT (100/50)	10L	0.01-0.2	ST 226-01	N S
117	DIQUAT	2764729	OSHA in house	0.1	1	GFF	120L	1	FLT 225-7	N
118	DLIMONENE	5989275	IN-HOUSE	0.1	10	CT (100/50)	10L	0.05-0.2	ST 226-01	N
119	DURSBAN (Chlorpyrifos)	2921882	OSHA 62	0.058	0.1	Special Collection Device	480L	1	ST 226-30-16 or OVS-2 from Forrest Biomedical	N P
120	DUST (RESPIRABLE)		NIOSH 0600	0.144	50	TARED 5um PVC + CYCLONE	75L @ 5 mg/m3 – 1000L	1.7	PVC, FLT 225-8-01 or 225-8202 (matched wt) FIELD	in field
121	DUST (TOTAL NUISANCE)		NIOSH 0500	0.056	50	TARED 5um PVC FILTER	25L @ 5 mg/m3 – 133L	1.5-2.0	FLT 225-8-01 or 225-8202 (matched wt) FIELD	in field
122	ENFLURANE (ETHANE OR ETHRANE)	13838169	OSHA 103	0.091	30	ANASORB CMS (150/75)	12L	0.05	ST 226-121 Store samples at reduced temperatures.	N S
123	ENFLURANE (Ethane or Ethrane)	13838169	OSHA 29	0.08	30	Two CT (100/50 or CT 400/200)	12L	0.1-0.2	ST 226-01 Tubes in series or ST 226-09	N
124	EPICHLOROHYDRIN	106898	NIOSH 1010 & OSHA 7	0.057	10	CT (100/50)	2L @ 2 ppm – 30L	0.01-0.2	ST 226-01	ALL
125	ETHANOLAMINE (Aminoethanol)	141435	OSHA 60	0.056	5	XAD-2 with 1-Napthylisothiocyanate	10 L=TWA 1.5L=STEL	0.1	ST 226-30-18	S
126	ETHOXYETHANOL (2-isomer) (Ethyl cellosolve)	110805	NIOSH 1403	0.059	20	CT (100/50)	1L-6L	0.01-0.05	ST 226-01 Not compatible with other organics. Store in FREEZER.	ALL
127	ETHOXYETHANOL (2-isomer) (Ethyl cellosolve)	110805	OSHA 79	0.081	0.75	CT (100/50)	15L-48L	0.1-1.0	ST 226-01 Not compatible with other organics. Store in FREEZER. Larger volume for lower PEL	N
128	ETHOXYETHYL ACETATE (2-isomer) (Cellosolve acetate)	111159	NIOSH 1450	0.062	20	CT (100/50)	1L-6L	0.01-0.05	ST 226-01 Not compatible with other organics. Store in FREEZER.	ALL
129	ETHOXYETHYL ACETATE (2-isomer) (Cellosolve acetate)	111159	OSHA 79	0.079	0.8	CT (100/50)	15L-48L	0.1-1.0	ST 226-01 Not compatible with other organics. Store in FREEZER. Larger volume for lower PEL	N
130	ETHYL ACETATE	141786	NIOSH 1457 & OSHA 7	0.058	15	CT (100/50)	6L	0.01-0.2	ST 226-01	ALL
131	ETHYL ACRYLATE	140885	NIOSH 1450 & OSHA 7	0.054	20	CT (100/50)	1L-10L	0.01-0.2	ST 226-01	N S
132	ETHYL ALCOHOL	64175	NIOSH 1400	0.065	10	CT (100/50)	0.1L-1.0L	0.05	ST 226-01 Not compatible with other organics. Refrigerate shipment.	ALL

ID #	CHEMICAL	CAS #	METHOD	CV	LOD (ug)	SAMPLING MEDIA	SAMPLE VOLUME (liter)	SAMPLING RATE (lpm)	INSTRUCTIONS	LAB
133	ETHYL ALCOHOL	64175	OSHA 100	0.077	10	ANASORB 747	12L	0.05	ST 226-82 Two tubes in series	ALL
134	ETHYL AMINE	75047	OSHA 36	0.08	0.3	XAD-7 COATED (100/50)	10L	0.2	ST 226-30-13-07	S
135	ETHYL BENZENE	100414	NIOSH 1501 & OSHA 7	0.089	10	CT (100/50)	10L-24L	0.01-0.2	ST 226-01	ALL
136	ETHYL BUTYL KETONE (3-Heptanone)	106354	NIOSH 1301 & OSHA 7	0.086	10	CT (100/50)	1L-25L	0.01-0.2	ST 226-01	ALL
137	ETHYL ETHER	60297	NIOSH 1610 & OSHA 7	0.053	10	CT (100/50)	0.25L-3.0L	0.01-0.2	ST 226-01 Not compatible with other organics.	N S
138	ETHYL ETHOXY PROPIONATE	763699	KODAK INHOUSE	0.1	2.4	CT (100/50)	10L	0.2	ST 226-01	N
139	ETHYL FORMATE	109944	OSHA 7	0.1	10	CT (100/50)	10L	0.01-0.2	ST 226-01	S
140	ETHYLENE DIAMINE	107153	OSHA 60	0.055	3.7	XAD-2 COATED	10L	0.1	ST 226-30-18	S
141	ETHYLENE DICHLORIDE (1,2 Dichloroethane)	107062	NIOSH 1003 & OSHA 7	0.079	10	CT (100/50)	1L @ 50 ppm - 50L	0.01-0.2	ST 226-01	ALL
142	ETHYLENE GLYCOL	107211	NIOSH 5500	0.087	4	GFF + SG (520/260)	0.3L-60L	0.01-0.2	FLT 225-16 & 226-15 Add 1ml 2% aqueous 2-propanol after sampling. Cap immediately.	ALL
143	ETHYLENE GLYCOL	107211	NIOSH 5523	0.05	10	XAD - OVS (200/100)	5L-60L	1	ST 226-57	N
144	ETHYLENE GLYCOL DINITRATE	628966	NIOSH 2507	0.089	0.6	TENAX GC (100/50)	3L-100L	0.2-1.0	Supelco 2-0832	N S
145	ETHYLENE GLYCOL MONOBUTYL ETHER ACETATE	112072	OSHA 83	0.055	7.2	CT (100/50)	48L	0.1	ST 226-01	ALL
146	ETHYLENE OXIDE (EtO)	75218	NIOSH 1614	0.062	1	HBR COATED CT (100/50)	3L	0.05-0.15	ST 226-38-03 Not compatible with other organics.	N
147	ETHYLENE OXIDE (3 M PASSIVE MONITOR)	75218	3M METHOD	0.062	1	3M EtO Monitor	15 minutes - 8 hours	0.0493	3M EtO Monitor #3551	S
148	ETHYLENE THIOUREA	96457	OSHA 95	0.016	1	Two GFF	500L	2	FLT 225-7 Two GFFs	N
149	FENAMIPHOS	22224926	OSHA in house	0.1	1	OVS-2	480L	1	ST 226-30-16	N
150	FIBER COUNT (CLEARANCE MONITORING)		OSHA 160	0.12	5.5 f/100 flds	0.8 um MCEF (25 mm)	3850L or greater	0.5-16	FL/CL 225-3-18 or 225-3-20 Adjust volume for fiber density = 100-1300 f/mm2	in field
151	FIBER COUNT (PERSONAL MONITORING)		NIOSH 7400	0.12	5.5 f/100 flds	0.8 um MCEF (25 mm)	400L @ 0.1 f/cc	0.5-2.5	FL/CL 225-3-18 or 225-3-20 Adjust volume for fiber density = 100-1300 f/mm2	In field
152	FIBROUS GLASS (as total NUISANCE DUST)		NIOSH 0500	0.056	50	TARED 5um PVC FILTER	25L @ 5 mg/m3 – 133L	1.5-2.0	FLT 225-8-01 or 225-8202 (matched wt) FIELD	In field
153	FIBROUS GLASS (by FIBER COUNT)		NIOSH 7400	0.12	5.5 f/100 flds	0.8 um MCEF (25 mm)	400L @ 0.1 f/cc	0.5-2.5	FL/CL 225-3-18 or 225-3-20 Adjust volume for fiber density = 100-1300 f/mm2	In field

ID #	CHEMICAL	CAS #	METHOD	CV	LOD (ug)	SAMPLING MEDIA	SAMPLE VOLUME (liter)	SAMPLING RATE (lpm)	INSTRUCTIONS	LAB
154	FICAM (BENDIOCARB)	22781233	OSHA IN-HOUSE	0.1	10	OVS-2	20 – 240 L	1	ST 226-30 OR OVS-2 from Forrest Biomedical (ph: 801-269-1327)	P
155	FORANE (Isoflurane)	26675467	OSHA 103	0.078	2.1	ANASORB CMS (150/75) or ANASORB 747	12L	0.05	ST 226-121 or ST 226-81 Store samples at reduced temperatures.	N S
156	FORMALDEHYDE	50000	SKC STEL	0.084	1	SKC STEL		15 MINUTES	SKC 526-200	N
157	FORMALDEHYDE	50000	SKC TWA	call lab	1	SKC TWA		4-8 HOURS	SKC 526-201	N
158	FORMALDEHYDE	50000	OSHA 52	0.073	0.8	XAD-2 COATED (150/75)	3L-24L	0.01-0.2	ST 226-117 or 226-54 STEL (0.2L for 15min) 48L for IAQ studies	N P
159	FORMALDEHYDE	50000	NIOSH 2016 (Modified)	0.1	1	2,4-DNPH SILICA GEL			SKC ST 226-119	S
160	FORMALDEHYDE	50000	NIOSH 2016 (Modified)	0.1	1	Waters XPO SURE	22.5 L or 96L	0.2 or 1.5	Waters WATO 47205	S
161	FORMIC ACID	64186	OSHA 112	call lab	37	CT (100/50)	48L	0.2	ST 226-01	N
162	FORMIC ACID	64186	OSHA 186SG	0.11	10	CT (100/50)	20L @10 ppm – 300L	0.01-1.0	ST 226-01 Not compatible with other organics.	P
163	FURFURYL ALCOHOL	98000	NIOSH 2505	0.073	10	PORAPAK Q (150/75)	3L-75L	0.01-0.05	Supelco Custom	N
164	GASOLINE	8006619	NIOSH 1550 & OSHA 48	0.089	80	CT (100/50)	3L	0.01-0.2	ST 226-01 Provide 5ml bulk sample.	ALL
165	GLUTARALDEHYDE	111308	NIOSH 2532 & OSHA 64	0.062	0.3	2,4-DNPH SILICA GEL	15L	1	ST 226-119	ALL
166	HALOTHANE (Fluothane)	151677	OSHA 103	0.064	2.4	ANASORB CMS	12L	0.05	ST 226-121	N S
167	HEPTACHLOR	76448	NIOSH S287	0.066	15	CHROMOSORB 102 (100/50)	60L-100L	0.01-1.0	ST 226-49-20102	N
168	HEPTANE (n-isomer)	142825	NIOSH 1500 & OSHA 7	0.056	10	CT (100/50)	4L	0.01-0.2	ST 226-01	ALL
169	HEPTANONE (3-isomer) (ethylbutylketone)	106354	NIOSH 1301 & OSHA 7	0.086	10	CT (100/50)	1L-25L	0.01-0.2	ST 226-01	ALL
170	HEPTANONE (2-isomer)(Methyl n-Amyl Ketone)	110430	NIOSH 1301 & OSHA 7	0.066	50	CT (100/50)	1L - 10L	0.01-0.2	ST 226-01	ALL
171	HEXACHLORO-ETHANE	67721	NIOSH 1003	0.12	10	CT (100/50)	1L-25L	0.01-0.2	ST 226-01	S
172	HEXAMETHYLENE DIISOCYANATE (HDI)	822060	OSHA 42	0.078	0.35	TREATED 37mm GFF	3L @ 1ppm – 70L	1	FLT 225-9002 or Call LAB for coated filters; Sample open faced.	N P
173	HEXAMETHYLENE DIISOCYANATE (HDI)	822060	OSHA 18 (Modified)	0.1	0.35	TREATED 37mm GFF	15L-240L	1	Call lab for sampler	S
174	HEXAMETHYLENE DIISOCYANATE BIURET (HDIB)	4035896	OSHA 47	0.13	1.1	TREATED 37mm GFF	15L-240L	1	FLT 225-9002 or Call LAB for coated filters; Sample open faced.	N
175	HEXANE (n-isomer)	110543	NIOSH 1500 & OSHA 7	0.062	10	CT (100/50)	4L	0.01-0.2	ST 226-01	ALL

ID #	CHEMICAL	CAS #	METHOD	CV	LOD (ug)	SAMPLING MEDIA	SAMPLE VOLUME (liter)	SAMPLING RATE (lpm)	INSTRUCTIONS	LAB
176	HEXANONE (2-isomer) (Methyl nButyl Ketone or MBK)	591786	NIOSH 1300 & OSHA 7	0.053	20	CT (100/50)	1L-10L	0.01-0.2	ST 226-01	ALL
177	HEXONE (Methyl Isobutyl Ketone or MIBK)	108101	NIOSH 1300 & OSHA 7	0.064	20	CT (100/50)	1L-10L	0.01-0.2	ST 226-01	ALL
178	HYDROGEN CHLORIDE	7647010	NIOSH 7903	0.059	0.7	SG (400/200) prewashed, or ORBO 53	3L-100L	0.2-0.5	ST 226-10-03 (may contain high sulfate) Supelco 2-0265M is preferred; send blanks	ALL
179	HYDROGEN FLUORIDE	7664393	NIOSH 7903	0.12	0.7	SG (400/200) prewashed, or ORBO 53	3L-100L	0.2-0.5	ST 226-10-03 (may contain high sulfate) Supelco 2-0265M is preferred; send blanks	ALL
180	HYDROGEN SULFIDE	7783064	NIOSH 6013	0.059	11	CT (400/200), washed, sulfur-free	1.2L-40L	0.1-1.5 recommend 0.2 LPM	Supelco ORBO 34	ALL
181	HYDROGENATED MDI (HMDI, not HDI)	5124301	OSHA 47	call lab	0.7	TREATED 37mm GFF	15L-240L	1	FLT 225-9002 or Call LAB for coated filters; Sample open faced. Note: HMDI is not the same chemical as HDI.	N
182	HYDROQUINONE	123319	NIOSH 5004	0.061	10	0.8 um MCEF	30L @ 2 mg/m3 - 180L	1-3 LPM	FLT 225-5 Ship filter in 10ml 1% aq Acetic Acid; ship in glass vial.	ALL
183	IRON FUME and particulate as Fe	1309371	NIOSH 7300 & OSHA 121	0.067	1	0.8 um MCEF	30L minimum	1-2 LPM	FLT 225-5	ALL
184	ISOFLURANE	26675467	OSHA 103	0.085	1	CT (100/50)	10L Maximum	0.1	ST-226-01 Store samples at reduced temperatures.	S
185	ISOPHORONE	78591	NIOSH 2508	0.05	20	CT (100/50)	2L-25L	0.01-1.0	ST 226-38 (Charcoal Petroleum base tubes)	N S
186	ISOPHORONE DIISOCYANATE	4098719	OSHA 42 & OSHA 18 (Modified)	0.12	0.3	TREATED 37mm GFF	15L-240L	1	FLT 225-9002 or Call LAB for coated filters; Sample open faced.	N S
187	JP4		NIOSH 1550 & OSHA 48	0.086	75	CT (100/50)	3L	0.01-0.2	ST 226-01 Provide 1 ml bulk sample.	ALL
188	JP5		NIOSH 1550 & OSHA 48	0.086	75	CT (100/50)	3L	0.01-0.2	ST 226-01 Provide 1 ml bulk sample.	ALL
189	JP8		NIOSH 1550 & NEPMU-2	0.086	75	CT (100/50)	3L	0.01-0.2	ST 226-01 Provide 1 ml bulk sample.	N S
190	KEROSENE	8030306	NIOSH 1550 & OSHA 48	0.05	75	CT (100/50)	1.3L @ 400 mg/m3 – 20L	0.01-0.2	ST 226-01 Provide 2 ml bulk sample.	ALL
191	LEAD and inorganic compounds as Pb	7439921	NIOSH 7300 & OSHA 125	0.06	7	0.8 um MCEF	400L	1-4LPM if Lab uses NIOSH method; 2 if OSHA.	FLT 225-5	ALL
192	LEAD and inorganic compounds as Pb	7439921	NIOSH 7082	0.072	2	0.8 um MCEF	200L @ 0.05 mg/m3 – 1200L	1-4 LPM	FLT 225-5	P
193	LEAD In blood		NIOSH 8003 lab modified	0.07	< 5 ug/dl	Heparinized vacutainer (BD #6488;#6527;#6541)			Mix thoroughly immediately after collection; refrigerate shipment using overnight courier service	ALL
194	LIGROINE		OSHA 48	0.069	3	CT (100/50)	3L	0.01-0.2	ST 226-01 Provide 5ml bulk sample.	S
195	LITHIUM (Li)	7439932	NIOSH 7300 & OSHA 125	0.1	1	0.8 um MCEF	100L	1-4LPM if Lab uses NIOSH method; 2 if OSHA.	FLT 225-5; Collect separately (Note: May be collected and analyzed with Sodium and Potassium also)	ALL

ID #	CHEMICAL	CAS #	METHOD	CV	LOD (ug)	SAMPLING MEDIA	SAMPLE VOLUME (liter)	SAMPLING RATE (lpm)	INSTRUCTIONS	LAB
196	MAGNESIUM OXIDE FUME as Mg	1309484	OSHA 121	0.073	1	0.8 um MCEF	480L	1-2 LPM	FLT 225-5	P
197	MAGNESIUM OXIDE FUME as Mg	1309484	NIOSH 7300 & OSHA 125	0.084	1	0.8 um MCEF	50L	1-4LPM if Lab uses NIOSH method; 2 if OSHA.	FLT 225-5	N S
198	MALATHION	121755	OSHA 62	0.056	1.8	Special Collection Device	60L	1-2 LPM	ST 226-30-16 or OVS-2 from Forrest Biomedical	ALL
199	MANGANESE (Mn)	7439965	NIOSH 7300 & OSHA 125	0.082	0.5	0.8 um MCEF	100L	1-4LPM if Lab uses NIOSH method; 2 if OSHA.	FLT 225-5	N S
200	MANGANESE (Mn)	7439965	NIOSH S5 & OSHA ID121	0.065	1	0.8 um MCEF	480L	1-2 LPM	FLT 225-5	P
201	MERCURY VAPOR as Hg	7439976	OSHA 140	0.089	0.03	PASSIVE BADGE	10L	0.02	SKC 520-02A (Badge) & 520-03 (Holder)	N
202	MERCURY VAPOR as Hg	7439976	NIOSH 6009	0.067	0.03	ANASORB C300 (200mg)	2L @ 0.05 mg/m3 - 100L	0.15-0.25	ST 226-17-1A Send two unexposed for blanks	ALL
203	MERCURY in urine		NIOSH 165 lab modified	0.073	< 5 ug/l	Drug screening bottle			Immediately add 100 milligrams potassium persulfate as preservative. Refrigerate shipment using overnight courier service	ALL
204	MESITYL OXIDE	141797	NIOSH 1301	0.071	50	CT (100/50)	1L-25L	0.01-0.2	ST 226-01	S
205	METALS (Pb, Fe, Cr, Zn, Cd, Mn, Co, V Cu, Ni, Be, Mo, Sb)		NIOSH 7300 & OSHA 125	call lab	call lab	0.8 um MCEF	400L	1-4LPM if Lab uses NIOSH method; 2 if OSHA.	Call LAB to determine if NIOSH or OSHA method is used for analysis. The method will determine your sampling rate.	ALL
206	METHANOL (Methyl Alcohol)	67561	NIOSH 2000	0.063	10	SG (100/50)	1L @ 200 ppm – 5L	0.02-0.2	ST 226-51 Not compatible with other organics. Use larger tubes when high quantities of methanol are expected.	ALL
207	METHOXYETHANOL (2-isomer) (Methyl cellosolve)	109864	NIOSH 1403	0.068	20	CT (100/50)	1L-10L	0.01-0.5	ST 226-01 Not compatible with other organics. Store in FREEZER.	ALL
208	METHOXYETHANOL (2-isomer) (Methyl cellosolve)	109864	OSHA 79	0.08	1	CT (100/50)	15L-48L	0.1-1.0 (1.0ml for STEL)	ST 226-01 Not compatible with other organics. Store in FREEZER.	ALL
209	METHOXYETHYL ACETATE (2-isomer)	109496	OSHA 79	0.079	1	CT (100/50)	15L-48L	0.1-1.0 (1.0ml for STEL)	ST 226-01 Not compatible with other organics. Store in FREEZER.	ALL
210	METHYL ACETATE	79209	OSHA 7	0.055	10	CT (100/50)	5L	0.01-0.2	ST 226-01	N S
211	METHYL CHLOROFORM (111Trichloroethane)	71556	NIOSH 1003 & OSHA 7	0.054	10	CT (100/50)	0.1L @ 350 ppm – 8L	0.01-0.2	ST 226-01	ALL
212	METHYL ETHYL KETONE (2-Butanone or MEK)	78933	NIOSH 2500	0.069	4	ORBO 90 (160/80)	1L-12L	0.01-0.2	Supelco #2-0358M, ST 226-81A or ST 226-121. Not compatible with other organics.	ALL
213	METHYL IODIDE	74884	NIOSH 1014	0.07	10	CT (100/50)	15L-50L	0.01-1.0	ST 226-01	N

ID #	CHEMICAL	CAS #	METHOD	CV	LOD (ug)	SAMPLING MEDIA	SAMPLE VOLUME (liter)	SAMPLING RATE (lpm)	INSTRUCTIONS	LAB
214	METHYL ISOBUTYL KETONE (MIBK)	108101	NIOSH 1300 & OSHA 7	0.064	20	CT (100/50)	1L-10L	0.01-0.2	ST 226-01	ALL
215	METHYLAL	109875	NIOSH 1611	0.06	10	CT (100/50)	1L-3L	0.01-0.2	ST 226-01	N
216	METHYLAMINE	74895	OSHA 40	0.078	1	XAD-7 COATED (100/50)	10L	0.2	ST 226-30-13-07	S
217	METHYLCYCLO-HEXANE	108872	NIOSH 1500 & OSHA 7	0.052	10	CT (100/50)	4L	0.01-0.2	ST 226-01	S
218	METHYLENEBIS-CHLOROANILINE (4,4',2 isomer) (MOCA)	101144	OSHA 71	0.058	0.05	GFF Treated	100L-180L	1	FLT 225-9004 or Call LAB for filters. Transfer to vial w/ 2ml DI water.	N
219	METHYLENEBIS-CHLOROANILINE (4,4',2 isomer) (MOCA)	101144	NIOSH 236	0.1	1	13 mm GFF + SG 50 mg	20L-50L	0.2-1.0	FLT 225-16 & ST 226-63	P S
220	METHYLENEBIS-PHENYLISOCYANATE (4,4' isomer) (MDI)	101688	OSHA 47	0.062	0.3	TREATED 37mm GFF	15L-240L	1	FLT 225-9002 or Call LAB for coated filters; Sample open faced.	N P
221	METHYLENEBIS-PHENYLISOCYANATE (4,4' isomer) (MDI)	101688	OSHA 18 (Modified)	0.1	0.3				Call lab for sampler	S
222	METHYLENE CHLORIDE (Dichloromethane)	75092	NIOSH 1005	0.073	10	Two CT (100/50)	0.5L @ 500 ppm – 2.5L	0.01-0.2	ST 226-01 Tubes in series; separate & cap, ship to LAB	ALL
223	METHYLENE CHLORIDE (Dichloromethane)	75092	OSHA 80	0.08	2	ANASORB CMS (150/75)	0.25L-3.0L	0.05	ST 226-121	N S
224	METHYLENEDI-ANILINE (4,4' isomer)	101779	OSHA 57	0.09	0.01	GFF Treated	100L	1	FLT 225-9004 or Call LAB for filters. Transfer to vial w/ 2ml DI water.	N
225	METHYLMETH-ACRYLATE	80626	OSHA 94	0.059	2	CT TBC Treated	3L	0.05	ST 226-73	N
226	METHYLMETH-ACRYLATE	80626	NIOSH 2537	0.063	10	XAD-2 (400/200)	1L @ 100 ppm – 8L	0.01-0.05	ST 226-30-06 Not compatible with other organics; Ship on dry ice.	N P
227	MINERAL OIL MIST (for WATER INSOLUBLE OILS)	8012951	NIOSH 5026	0.065	50	0.8 um or 5.0 um MCEF/PVC/ GFF	20L @ 5 mg/m3 – 50L	1-2 LPM	FLT 225-5 Provide 5 ml bulk oil which must be water insoluble.	N
228	MINERAL SPIRITS	8030306	NIOSH 1550 & OSHA 48	0.05	75	CT (100/50)	1.3L @ 400 mg/m3 – 20L	0.01-0.2	ST 226-01 Provide 2 ml bulk sample.	ALL
229	MOLYBDENUM (Mo)	7439987	OSHA 121	0.091	0.5	0.8 um MCEF	480L	1-2 LPM	FLT 225-5	N P

ID #	CHEMICAL	CAS #	METHOD	CV	LOD (ug)	SAMPLING MEDIA	SAMPLE VOLUME (liter)	SAMPLING RATE (lpm)	INSTRUCTIONS	LAB
230	MOLYBDENUM (Mo)	7439987	NIOSH 7300 & OSHA 125	0.094	1	0.8 um MCEF	50L	1-4LPM if Lab uses NIOSH method; 2 if OSHA.	FLT 225-5	N S
231	MORPHOLINE	110918	NIOSH S150	0.057	1.5	SG (150/75)	20L	0.01-0.2	ST 226-10	ALL
232	NAPHTHALENE	91203	OSHA 35	0.064	4	CHROMOSORB 106 (100/50)	10L	0.2	ST 226-49-60106	N S
233	NAPHTHAS (REFINED PETROLEUM SOLVENTS)	8030306	NIOSH 1550 & OSHA 48	0.05	75	CT (100/50)	1.3L @ 400 mg/m3 – 20L	0.01-0.2	ST 226-01 Provide 2 ml bulk sample.	ALL
234	NICKEL (Ni)	7440020	OSHA 121	0.061	1	0.8 um MCEF	480L	1-2 LPM	FLT 225-5	P
235	NICKEL (Ni)	7440020	NIOSH 7300 & OSHA 125	0.077	1	0.8 um MCEF	100L	1-4LPM if Lab uses NIOSH method; 2 if OSHA.	FLT 225-5	N S
236	NITRIC ACID (HNO3)	7697372	NIOSH 7903	0.085	0.7	SG (400/200) prewashed, or ORBO 53	50L-100L	0.2-0.5	ST 226-10-03 or SUPELCO ORBO 53 (2-0265F); Send blanks	ALL
237	NITROGEN DIOXIDE	10102440	OSHA 182	0.084	1	MOLECULAR SIEVE TUBE	3L	0.2	ST 226-40-02	N S
238	NITROGEN DIOXIDE / NITRIC OXIDE (NOX)	10102440 / 10102439	OSHA 182 & OSHA 190	0.084	1	MOLECULAR SIEVE TUBE	3L	0.01-0.025	ST 226-40	N S
239	NITROGLYCERIN	556300	NIOSH 2507 & OSHA 43	0.104	0.6	TENAX (100/50)	15L	1	ST 226-35-03	N
240	NITROMETHANE	75525	NIOSH 2527	0.078	0.3	CHROMOSORB 106 (600/300)	1.2L-3L	0.01-0.5	Supelco Custom	N
241	NITROPROPANE (1 isomer)	108032	OSHA 46A	0.072	0.4	XAD-4 (80/40)	4L	0.01-0.1	ST 226-30-11-04	S
242	NITROPROPANE (2 isomer)	79469	OSHA 46B	0.062	0.4	XAD-4 (80/40)	4L	0.01-0.1	ST 226-30-11-04	S
243	NITROUS OXIDE	10024972		0.063	1 ppm	PASSIVE DOSIMETER			Obtain from R.S. Landauer	N
244	NITROUS OXIDE (FIELD IR METHOD)	10024972	NIOSH 6600	0.063	1 ppm				Analyze in field using portable IR equipment.	In field
245	NMETHYL-2-PYRROLIDINONE	872504	OSHA IN-HOUSE	0.007	10	CT (100/50)	10 L	0.2	ST 226-01	N
246	OCTANE	111659	NIOSH 1500 & OSHA 7	0.06	10	CT (100/50)	4L	0.01-0.2	ST 226-01	S
247	ORGANIC VAPOR MONITOR (3M PASSIVE MONITOR)		3M METHOD & OSHA 7	3 M	3M	3M Brand Monitor	2 - 8 hours		3M OVM #3500	ALL
248	ORTHENE (Acephate)	30560191	OSHA in house	0.1	1	37 mm GFF	250L	1	FLT 225-7	N
249	ORYZALIN	19044883	OSHA IN HOUSE	0.1	10	GFF PLUS MI (ISOPROPANOL)	20 – 120 L	1	FLT 225-17-01 (Send 50 ml of isopropanol for blank and preparation of standards)	P

ID #	CHEMICAL	CAS #	METHOD	CV	LOD (ug)	SAMPLING MEDIA	SAMPLE VOLUME (liter)	SAMPLING RATE (lpm)	INSTRUCTIONS	LAB
250	OZONE	10028156	OSHA 214	0.081	1	Two Treated GFF	45L	1	Call LAB for filters.	N
251	PENTACHLORO-PHENOL (PCP)	87865	OSHA 39	0.067	0.33	GFF + two XAD-7 (80/40)	48L	0.01-0.2	ST 226-30-11-07 & FLT 225-7	ALL
252	PENTANE	109660	NIOSH 1500 & OSHA 7	0.064	10	CT (100/50)	2L	0.01-0.05	ST 226-01	ALL
253	PENTANONE (Methyl Propyl Ketone)	107879	NIOSH 1300 & OSHA 7	0.063	20	CT (100/50)	1L-10L	0.01-0.2	ST 226-01	P S
254	PERCHLORO-ETHYLENE	127184	NIOSH 1003 & OSHA 7	0.052	10	CT (100/50)	0.2L @ 100 ppm – 40L	0.01-0.2	ST 226-01	ALL
255	PESTICIDES		OSHA 62						Call LAB for information.	ALL
256	PETROLEUM ETHER	8032324	NIOSH 1550 & OSHA 48	0.05	75	CT (100/50)	1.3L @ 400 mg/m3 – 20L	0.01-0.2	ST 226-01 Provide 2 ml bulk sample.	ALL
257	PHENOL	108952	OSHA 32	0.055	1	XAD-7 (100/50)	24L	0.01-0.1	ST 226-30-12-07 Not compatible with other organics.	ALL
258	PHENYL-1-CYCLOEXENE	4994165	OSHA IN-HOUSE	0.045		CT (100/50)	10 L	0.2 LPM	ST 226-01	N
259	PHENYL GLYCIDYL ETHER	122601	NIOSH 1619	0.057	10	CT (100/50)	80L @ 1 ppm - 150L	0.01-1.0	ST 226-01	N
260	PHOSPHORIC ACID	7664382	OSHA 111	0.067	2	0.8 um MCEF	100L-400L	0.2-2.0	FLT 225-5 Transfer and ship in glass vial	ALL
261	PHOSPHORIC ACID	7664382	NIOSH 7903	0.096	2	SG (400/200)	50L - 100L	0.2-0.5	ST 226-10-03	S
262	POLYCHLOROB-PHENYLS (PCBS or AROCHLORS)	53469219 /1109769 1	NIOSH 5503	0.067	0.03	GFF + FLORISIL (100/50)	1L @ 0.5 mg/m3 – 50L	0.05-0.2	FLT 225-16 & ST 226-39 Ship in glass vials; Provide 1ml bulk	ALL
263	POLYNUCLEAR AROMATIC HYDROCARBONS (PNAH)		OSHA 58 (Modified)	0.08	0.2	PTFE	960L	2	FLT 225-17-07 Ship immediately in Al foil wrapped glass vial.	N
264	POLYNUCLEAR AROMATIC HYDROCARBONS (PNAH)		NIOSH 5506	0.125	0.2	PFTE + XAD2 (150/75)	200L-1000L	2	FLT 225-17-07 & ST 226-30-05 Ship immediately in Al foil wrapped glass vial.	P S
265	POTASSIUM (K)	7440097	OSHA 121	0.073	1	0.8 um MCEF	480L	1-2 LPM	FLT 225-5; Collect separately. (NOTE: May be analyzed with Sodium and Lithium)	ALL
266	PROPYL ACETATE (iso-PAc)	108214	OSHA 7	0.068	20	CT (100/50)	10L	0.01-0.2	ST 226-01	N S
267	PROPYL ACETATE (n-PAc)	109604	NIOSH 1450 & OSHA 7	0.068	20	CT (100/50)	1L-10L	0.01-0.2	ST 226-01	N S
268	PROPYL ALCOHOL (iso-PA)	67630	NIOSH 1400 & OSHA 7	0.064	10	CT (100/50)	0.2L-3L	0.01-0.2	ST 226-01 Not compatible with other organics. Store in FREEZER.	P S
269	PROPYL ALCOHOL (n-PA)	71238	NIOSH 1401& OSHA 7	0.075	10	CT (100/50)	1L-10L	0.01-0.2	ST 226-01 Not compatible with other organics. Store in FREEZER.	ALL
270	PROPYLENE GLYCOL DINITRATE (PGDN OR OTTO FUEL)	6423434	NIOSH 2507 (Modified)	0.104	1	TENAX (100/50)	2L @ 0.5 mg/m3 - 10L	0.2-1.0	ST 226-35-03 2 blanks are absolutely required. Not compatible with other organics.	ALL
271	PROPYLENE GLYCOL ETHYL ETHER	1569024	NIOSH 1403	0.022	10	CT (100/50)	1 – 10 L	0.01 – 0.5 LPM	ST 226-01 Not compatible with other organics.	N

ID #	CHEMICAL	CAS #	METHOD	CV	LOD (ug)	SAMPLING MEDIA	SAMPLE VOLUME (liter)	SAMPLING RATE (lpm)	INSTRUCTIONS	LAB
272	PROPYLENE GLYCOL MONOMETHYL ETHER	107982	OSHA 99	0.055	1	CT (100/50)	3L-10 L	0.05-0.2 0.2L for 15 min STEL	ST 226-01; Not compatible with other organics.	N P
273	PROPYLENE GLYCOL MONOMETHYL ETHER ACETATE	108656	OSHA 99	0.049	1	CT (100/50)	3L-10 L	0.05-0.2 0.2L for 15 min STEL	ST 226-01 Not compatible with other organics.	N
274	PYRETHRUM	8003347	OSHA 62	0.065	0.01	Special Collection Device	60L	1	ST 226-30-16 or OVS-2 from Forrest Biomedical	ALL
275	PYRIDINE	110861	NIOSH 1613	0.059	20	CT (100/50)	18L-150L	0.01-1.0	ST 226-01 Not compatible with other organics.	N S
276	RDX (Cyclonite)	121824	OSHA in house	0.1	1	GFF	960L	2	FLT 225-7	N
277	ROUNDUP	38641940	OSHA in house	0.1	1	GFF	100L	1	FLT 225-7	N
278	SAFROTIN		OSHA in house	0.1	1	GFF	60L	1	FLT 225-7	N
279	SELENIUM COMPOUNDS AS (Se)	7782492	NIOSH 7300 & OSHA 125	0.122	1	0.8 um MCEF	100L	1-4LPM if Lab uses NIOSH method; 2 if OSHA.	FLT 225-5	N S
280	SEVIN (Carbaryl)	632522	OSHA 63	0.063	1.7	Special Collection Device	60L	1	ST 226-30-16 or OVS-2 from Forrest Biomedical	N P
281	SEVOFLURANE	28523866	OSHA 103	0.013	15	CMS 150/75 or ANASORB 747	12 L	0.05 LPM	ST 226-121 or ST 226-81	N
282	SILICA (CRYSTALLINE, RESPIRABLE)		OSHA 142	0.106	10	5 um PVC + CYCLONE	400L @ 0.05 mg/m3 – 1000L	1.7	FLT 225-8-01	P
283	SILVER and soluble compounds as Ag	7440224	NIOSH 7300 & OSHA 125	0.07	1	0.8 um MCEF	250L	1-4LPM if Lab uses NIOSH method; 2 if OSHA.	FLT 225-5	N S
284	SILVER and soluble compounds as Ag	7440224	OSHA 121	0.05	1	0.8 um MCEF	480L	1-2 LPM	FLT 225-5	P
285	SODIUM (Na)	7440235	OSHA 121	0.073	1	0.8 um MCEF	480L	1-2 LPM	FLT 225-5; Collect separately (NOTE: May be analyzed with Potassium and Lithium only.)	ALL
286	SODIUM HYDROXIDE	1310732	OSHA 121 (Modified)	0.073	1	1.0 um PTFE	13L-200L	1-4 LPM	FLT 225-17-01 (These filters have low Na background) Collect separately (NOTE: May be analyzed with Potassium and Lithium only.)	ALL
287	STODDARD SOLVENT (PD680)	8052413	NIOSH 1550 & OSHA 48	0.05	75	CT (100/50)	1.3L @ 400 mg/m3 – 20L	0.01-0.2	ST 226-01 Provide 2 ml bulk sample.	ALL
288	STYRENE (MONOMER)	100425	NIOSH 1501	0.058	10	CT (100/50)	5L-14L	0.1-1.0	ST 226-01	ALL
289	SULFUR DIOXIDE	7446095	OSHA 104	0.092	3	MCEF + BUBBLER	15L-60L	1	10-15 ml of 0.3N hydrogen peroxide	N
290	SULFUR DIOXIDE	7446095	OSHA 200	0.098	0.5	ANASORB 747	1.5L-12L	0.1	ST 226-80	N
291	SULFURIC ACID	7664939	OSHA 113	0.09	0.9	0.8 um MCEF	480L	1-3 LPM	FLT 225-5 Remove filter and ship in glass vial.	ALL
292	SULFURIC ACID	7664939	NIOSH 7903	0.087	0.9	SG (400/200)	50L-100L	0.2-0.5	ST 226-10-03	S
293	TETRACHLORO-ETHYLENE (Perchloroethylene)	127184	NIOSH 1003 & OSHA 7	0.052	10	CT (100/50)	0.2L @ 100 ppm – 40L	0.01-0.2	ST 226-01	ALL

ID #	CHEMICAL	CAS #	METHOD	CV	LOD (ug)	SAMPLING MEDIA	SAMPLE VOLUME (liter)	SAMPLING RATE (lpm)	INSTRUCTIONS	LAB
294	TETRAETHYL LEAD (as Pb)	78002	OSHA in house	0.097	2	GFF + CT (100/50)	180L	0.75	FLT 225-7 & ST 226-01	ALL
295	THIONYLCHLORIDE	7719097	OSHA 174SG	0.059	1	BUBBLER	15L	1	15ml of DI WATER - SEND 50ml of UNEX- POSED DI WATER	N
296	THIRAM	137268	NIOSH 5005	0.055	10	PTFE	40 – 240 L	3 LPM	FLT 227-17-01	P
297	TIN (INORGANIC COMPOUNDS) as Sn	7440315	OSHA 121	0.079	20	0.8 um MCEF	480L	1-2 LPM	FLT 225-5	P
298	TIN (INORGANIC COMPOUNDS) as Sn	7440315	OSHA 206 & OSHA 125	0.055	1	0.8 um MCEF	100L	1-4 LPM	FLT 225-5	N S
299	TITANIUM DIOXIDE	13463677	NIOSH 0500	0.056	0.03	TARED PVC	100L	2	FLT 225-8-01, Preweighed filter required or 225-8202 (Matched wt)	N S
300	TOLUENE	108883	NIOSH 1500/1501 & OSHA 7	0.052	10	CT (100/50)	2L-8L	0.01-0.2	ST 226-01	ALL
301	TOLUENE2,4 DIISOCYANATE (2,4TDI)	584849	OSHA 42 & OSHA 18 (Modified)	0.085	1.3	TREATED 37mm GFF	15L-240L	1	FLT 225-9002 or Call LAB for coated filters; Sample open faced.	ALL
302	TOLUENE2,6 DIISOCYANATE (2,6 TDI)	91087	OSHA 42 & OSHA 18 (Modified)	0.145	1.6	TREATED 37mm GFF	15L-240L	1	FLT 225-9002 or Call LAB for coated filters; Sample open faced.	ALL
303	TRIBROMO-METHANE	75252	NIOSH 1003	0.043	10	CT (100/50)	4L @ 0.5 ppm – 70L	0.01-0.2	ST 226-01	N S
304	TRICHLORO-ETHANE (1,1,2 isomer)	79005	NIOSH 1003 & OSHA 7	0.057	10	CT (100/50)	2L @ 10 ppm – 60L	0.01-0.2	ST 226-01	ALL
305	TRICHLORO-ETHANE (1,1,1 isomer) (Methylchloroform)	71556	NIOSH 1003 & OSHA 7	0.054	10	CT (100/50)	0.1L @ 350 ppm – 8L	0.01-0.2	ST 226-01	ALL
306	TRICHLORO-ETHYLENE	79016	NIOSH 1022 & OSHA 7	0.082	10	CT (100/50)	1L @ 100 ppm – 30L	0.01-0.2	ST 226-01	ALL
307	TRICHLORO-PROPANE (1,2,3 TCP)	96184	NIOSH 1003 & OSHA 7	0.068	10	CT (100/50)	0.6L @ 50ppm – 60L	0.01-0.2	ST 226-01	S
308	TRICHLOROTRI-FLUOROETHANE (R 113)	76131	NIOSH 1020	0.07	5	CT (100/50)	0.1L @ 10 ppm - 0.05L	0.01-0.05	ST 226-01 REFRIGERATE Shipment to LAB	ALL
309	TRIMETHYLAMINE	75503	OSHA IN-HOUSE	0.014	19.5	XAD-7 (Must be coated with 10% phosphoric acid)	10 – 20 L	0.1 – 0.2	ST 226-98	N
310	TRINITROTOLUENE (2,4,6 TNT)	118967	OSHA 44	0.161	1.2	GFF+TENAX (100/50)	40L-80L	0.1-1.0	FLT 225-7 & ST 226-35-03	N

ID #	CHEMICAL	CAS #	METHOD	CV	LOD (ug)	SAMPLING MEDIA	SAMPLE VOLUME (liter)	SAMPLING RATE (lpm)	INSTRUCTIONS	LAB
311	TRIORTHOCRESYL PHOSPHATE (TOCP)	78308	NIOSH S209	0.086	0.1	0.8 um MCEF	100L	<1.5	FLT 225-5	N S
312	TRIPHENYL PHOSPHATE	115866	NIOSH 5038	0.066	10	0.8 um MCEF	10L @ 3 mg/m3 – 400L	1-3 LPM	FLT 225-5	N
313	TUNGSTEN (W)	7440337	OSHA 213	0.1	1	0.8 um MCEF	100L	2	FLT 225-5 Only W & Co can be analyzed	N
314	TURPENTINE	8006642	NIOSH 1551	0.055	10	CT (100/50)	1L @ 560 mg/m3 – 10L	0.01-0.2	ST 226-01 Provide 1 ml bulk sample.	ALL
315	VANADIUM FUME & DUST as V	1314621	NIOSH 7300 & OSHA 125	0.095	0.5	0.8 um MCEF	200L	1-4LPM if Lab uses NIOSH method; 2 if OSHA.	FLT 225-5	N S
316	VANADIUM FUME & DUST as V	1314621	OSHA 121	0.067	0.5	0.8 um MCEF	480L	1-2 LPM	FLT 225-5	P
317	VINYL CHLORIDE (MONOMER)	75014	NIOSH 1007	0.06	0.04	Two CT (100/50)	0.7L-5L	0.05	ST 226-01 Tubes in series; separate & cap, ship to LAB	N
318	VINYLACETATE	108054	OSHA 51	0.058	1	AMBERSORB XE 347	24L	0.1	Tubes not available from SKC, call LAB for source.	N
319	VINYLIDENE CHLORIDE	75354	OSHA in house	0.1	10	CT (100/50)	3L	0.2	ST 226-01	N
320	VM&P NAPHTHA	8032324	NIOSH 1550 & OSHA 48	0.05	75	CT (100/50)	1.3L @ 400 mg/m3 – 20L	0.01-0.2	ST 226-01 Provide 2 ml bulk sample.	ALL
321	WAX (PARAFFIN FUME)	8002742	OSHA IN-HOUSE			GFF	100L	1.0 LPM	FLT 225-7	N
322	XYLENEDIAMINE	1477550	OSHA 105	call lab	call lab	Two Treated GFF	15L-100L	1	Call LAB for treated filters	N
323	XYLENES (all isomers)	1330207	NIOSH 1501 & OSHA 7	0.06	10	CT (100/50)	12L-23L	0.01-0.2	ST 226-01	ALL
324	ZINC and compounds as Zn	7440666	NIOSH 7300 & OSHA 125	0.057	0.05	0.8 um MCEF	100L	1-4LPM if Lab uses NIOSH method; 2 if OSHA.	FLT 225-5	N S
325	ZINC and compounds as Zn	7440666	OSHA 121	0.089	0.1	0.8 um MCEF	480L	1-2 LPM	FLT 225-5	P
326	ZINC PROTOPORPHRYIN in blood		Lab method	0.10	< 10 ug/dl	Heparinized vacutainer (BD #6488;#6527;#6541)			Mix thoroughly immediately after collection; refrigerate shipment using overnight courier service	ALL

CAS #	ANALYTE	ID #
50000	FORMALDEHYDE	156
50000	FORMALDEHYDE	157
50000	FORMALDEHYDE	158
50000	FORMALDEHYDE	159
50000	FORMALDEHYDE	160
56235	CARBON TETRACHLORIDE	70
57749	CHLORDANE	71
60297	ETHYL ETHER	137
60571	DIELDRIN	107
62533	ANILINE	28
62737	DDVP (Dichlorovos)	97
64175	ETHYL ALCOHOL	132
64175	ETHYL ALCOHOL	133
64186	FORMIC ACID	161
64186	FORMIC ACID	162
64197	ACETIC ACID	1
64197	ACETIC ACID	2
64197	ACETIC ACID	3
67561	METHANOL (Methyl Alcohol)	206
67630	PROPYL ALCOHOL (iso-PA)	268
67641	ACETONE	4
67641	ACETONE	5
67663	CHLOROFORM (trichloromethane)	75
67721	HEXACHLOROETHANE	171
68122	DIMETHYFORMAMIDE (DMF)	111
71238	PROPYL ALCOHOL (n-PA)	269
71363	BUTYL ALCOHOL (n-isomer)	57
71432	BENZENE	38
71556	METHYL CHLOROFORM (111Trichloroethane)	211
71556	TRICHLOROETHANE (1,1,1 isomer) (Methylchloroform)	305
74884	METHYL IODIDE	213
74895	METHYLAMINE	216
75014	VINYL CHLORIDE (MONOMER)	317
75047	ETHYL AMINE	134
75058	ACETONITRILE	6

CAS #	ANALYTE	ID #
75092	METHYLENECHLORIDE (Dichloromethane)	222
75092	METHYLENECHLORIDE (Dichloromethane)	223
75150	CARBON DISULFIDE	69
75218	ETHYLENE OXIDE (EtO)	146
75218	ETHYLENE OXIDE 3M (PASSIVE MONITOR)	147
75252	BROMOFORM (tribromomethane)	46
75252	TRIBROMOMETHANE	303
75343	DICHLOROETHANE (1,1 isomer)	104
75354	VINYLIDENE CHLORIDE	319
75503	TRIMETHYLAMINE	309
75525	NITROMETHANE	240
75638	BROMOTRIFLUOROMETHANE (R 13B1)	47
75650	BUTYL ALCOHOL (tert-isomer)	59
75718	DICHLORODIIFLUOROMETHANE (R 12)	103
75729	CHLOROTRIFLUOROMETHANE (R 13)	76
76131	TRICHLOROTRIFLUOROETHANE (R 113)	308
76222	CAMPHOR (SYNTHETC)	66
76448	HEPTACHLOR	167
78002	TETRAETHYL LEAD (as Pb)	294
78308	TRIORTHOCRESYL PHOSPHATE (TOCP)	311
78591	ISOPHORONE	185
78831	BUTYL ALCOHOL (iso-isomer)	56
78922	BUTYL ALCOHOL (sec-isomer)	58
78933	BUTANONE (methyl ethyl ketone or MEK)	49
78933	BUTANONE (methyl ethyl ketone or MEK)	50
78933	METHYL ETHYL KETONE (2-Butanone or MEK)	212
79005	TRICHLOROETHANE (1,1,2 isomer)	304
79016	TRICHLOROETHYLENE	306
79061	ACRYLAMIDE	15
79209	METHYL ACETATE	210
79469	NITROPROPANE (2 isomer)	242
80057	BISPHENOL A	43

CAS #	ANALYTE	ID #
80626	METHYLMETHACRYLATE	225
80626	METHYLMETHACRYLATE	226
84742	DIBUTYL PHTHALATE	101
87865	PENTACHLOROPHENOL (PCP)	251
91087	TOLUENE2,6 DIISOCYANATE (2,6 TDI)	302
91203	NAPHTHALENE	232
95501	DICHLOROBENZENE (ortho-isomer)	102
96184	TRICHLOROPROPANE (1,2,3 TCP)	307
96457	ETHYLENE THIOUREA	148
98000	FURFURYL ALCOHOL	163
98828	CUMENE (isopropyl benzene)	88
100414	ETHYL BENZENE	135
100425	STYRENE (MONOMER)	288
100516	BENZY ALCOHOL	40
101144	METHYLENEBISCHLOROANILINE (4,4',2 isomer) (MOCA)	218
101144	METHYLENEBISCHLOROANILINE (4,4',2 isomer) (MOCA)	219
101688	METHYLENEBISPHENYLISOCYANATE (4,4' isomer) (MDI)	220
101688	METHYLENEBISPHENYLISOCYANATE (4,4' isomer) (MDI)	221
101779	METHYLENEDIANILINE (4,4' isomer)	224
105464	BUTYL ACETATE (sec-isomer)	54
106354	ETHYL BUTYL KETONE (3-Heptanone)	136
106354	HEPTANONE (3-isomer) (ethylbutylketone)	169
106898	EPICHLOROHYDRIN	124
106990	BUTADIENE (1,3 isomer)	48
107028	ACROLEIN	14
107062	DICHLOROETHANE (1,2 isomer) (Ethylene dichloride)	105
107062	ETHYLENE DICHLORIDE (1,2 Dichloroethane)	141
107131	ACRYLONITRILE	16
107153	ETHYLENE DIAMINE	140
107211	ETHYLENE GLYCOL	142
107211	ETHYLENE GLYCOL	143
107879	PENTANONE (Methyl Propyl Ketone)	253
107982	PROPYLENE GLYCOL MONOMETHYL ETHER	272

CAS #	ANALYTE	ID #
108032	NITROPROPANE (1 isomer)	241
108054	VINYLACETATE	318
108101	HEXONE (Methyl Isobutyl Ketone or MIBK)	177
108101	METHYL ISOBUTYL KETONE (MIBK)	214
108214	PROPYL ACETATE (iso-PAc)	266
108656	PROPYLENE GLYCOL MONOMETHYL ETHER ACETATE	273
108838	DIISOBUTYL KETONE	110
108872	METHYLCYCLOHEXANE	217
108883	TOLUENE	300
108907	CHLOROBENZENE	73
108918	CYCLOHEXYLAMINE	95
108930	CYCLOHEXANOL	91
108941	CYCLOHEXANONE	92
108941	CYCLOHEXANONE	93
108952	PHENOL	257
109496	METHOXYETHYL ACETATE ,	209
109604	PROPYL ACETATE (n-PAc)	267
109660	PENTANE	252
109864	METHOXYETHANOL, (2-isomer) (Methyl cellosolve)	207
109864	METHOXYETHANOL, (2-isomer) (Methyl cellosolve)	208
109875	METHYLAL	215
109944	ETHYL FORMATE	139
110190	BUTYL ACETATE (iso-isomer)	52
110430	HEPTANONE (2-isomer)(Methyl n-Amyl Ketone)	170
110543	HEXANE (n-isomer)	175
110805	ETHOXYETHANOL,	126
110805	ETHOXYETHANOL, (2-isomer)	127
110827	CYCLOHEXANE	90
110838	CYCLOHEXENE	94
110861	PYRIDINE	275
110918	MORPHOLINE	231
111159	ETHOXYETHYL ACETATE, (2-isomer), (Cellosolve acetate)	128
111159	ETHOXYETHYL ACETATE, (2-isomer) (Cellosolve acetate)	129

CAS #	ANALYTE	ID #
111308	GLUTARALDEHYDE	165
111400	DIETHYLENE TRIAMINE	109
111659	OCTANE	246
111762	BUTOXYETHANOL (butyl cellosolve)	51
112072	ETHYLENE GLYCOL MONOBUTYL ETHER ACETATE	145
114261	BAYGON (propoxur)	36
115866	TRIPHENYL PHOSPHATE	312
117840	DIOCTYL PHTHALATE	113
117840	DIOCTYL PHTHALATE	114
118967	TRINITROTOLUENE (2,4,6 TNT)	310
121755	MALATHION	198
121824	CYCLONITE (RDX)	96
121824	RDX (Cyclonite)	276
122601	PHENYL GLYCIDYL ETHER	259
123319	HYDROQUINONE	182
123422	DIACETONE ALCOHOL	99
123513	AMYL ALCOHOL (iso-isomer)	27
123864	BUTYL ACETATE (n-isomer)	53
123911	DIOXANE (1,4 Diethylene dioxide)	115
123922	AMYL ACETATE (iso-isomer)	24
127184	PERCHLOROETHYLENE	254
127184	TETRACHLOROETHYLENE (Perchloroethylene)	293
127195	DIMETHYLACETAMIDE	112
137268	THIRAM	296
140885	ETHYL ACRYLATE	131
141435	AMINOETHANOL (Ethanolamine)	20
141435	ETHANOLAMINE (Aminoethanol)	125
141786	ETHYL ACETATE	130
141797	MESITYL OXIDE	204
142825	HEPTANE (n-isomer)	168
151677	HALOTHANE (Fluothane)	166
309002	ALDRIN	17
314409	BROMACIL	44
333415	DIAZINON	100
540590	DICHLOROETHYLENE (1,2 isomer)	106

CAS #	ANALYTE	ID #
540885	BUTYL ACETATE (tert-isomer)	55
556300	NITROGLYCERIN	239
584849	TOLUENE2,4 DIISOCYANATE (2,4TDI)	301
591786	HEXANONE (2-isomer) (Methyl nButyl Ketone or MBK)	176
626380	AMYL ACETATE (sec-isomer)	26
628637	AMYL ACETATE (n-isomer)	25
628966	ETHYLENE GLYCOL DINITRATE	144
632522	CARBARYL (Sevin)	67
632522	SEVIN (Carbaryl)	280
763699	ETHYL ETHOXY PROPIONATE	138
822060	HEXAMETHYLENE DIISOCYANATE (HDI)	172
822060	HEXAMETHYLENE DIISOCYANATE (HDI)	173
872504	NmeTHYL-2-PYRROLIDINONE	245
1309371	IRON FUME and particulate as Fe	183
1309484	MAGNESIUM OXIDE FUME as Mg	196
1309484	MAGNESIUM OXIDE FUME as Mg	197
1310732	SODIUM HYDROXIDE	286
1314621	VANADIUM FUME & DUST as V	315
1314621	VANADIUM FUME & DUST as V	316
1319773	CRESOL (ALL ISOMERS)	87
1330207	XYLENES (all isomers)	323
1333864	CARBON BLACK (NONSPECIFIC)	68
1477550	XYLENEDIAMINE	322
1569024	PROPYLENE GLYCOL ETHYL ETHER	271
2426086	BUTYL GLYCIDYL ETHER (BGE)	60
2698411	CHLOROBENZYLIDENE MALONONITRILE	74
2764729	DIQUAT	117
2921882	CHLORPYRIFOS (Dursban)	77
2921882	DURSBAN (Chlorpyrifos)	119
4035896	HEXAMETHYLENE DIISOCYANATE BIURET (HDIB)	174
4098719	ISOPHORONE DIISOCYANATE	186
4994165	PHENYL-1-CYCLOEXENE	258
5124301	HYDROGENATED MDI (HMDI, not HDI)	181
5989275	DLIMONENE	118

CAS #	ANALYTE	ID #
6423434	PROPYLENE GLYCOL DINITRATE (PGDN OR OTTO FUEL)	270
7429905	ALUMINUM and compounds as (Al) except Al2O3	18
7429905	ALUMINUM and compounds as (Al) except Al2O3	19
7439921	LEAD and inorganic compounds as Pb	191
7439921	LEAD and inorganic compounds as Pb	192
7439932	LITHIUM (Li)	195
7439965	MANGANESE (Mn)	199
7439965	MANGANESE (Mn)	200
7439976	MERCURY (Hg) VAPOR as Hg	201
7439976	MERCURY (Hg) VAPOR as Hg	202
7439987	MOLYBDENUM (Mo)	229
7439987	MOLYBDENUM (Mo)	230
7440020	NICKEL (Ni)	234
7440020	NICKEL (Ni)	235
7440097	POTASSIUM (K)	265
7440224	SILVER and soluble compounds as Ag	283
7440224	SILVER and soluble compounds as Ag	284
7440235	SODIUM (Na)	285
7440315	TIN (INORGANIC COMPOUNDS) as Sn	297
7440315	TIN (INORGANIC COMPOUNDS) as Sn	298
7440337	TUNGSTEN (W)	313
7440360	ANTIMONY (Sb)	29
7440360	ANTIMONY (Sb)	30
7440382	ARSENIC and compounds as As	31
7440382	ARSENIC and compounds as As	32
7440382	ARSENIC and compounds as As	33
7440417	BERYLLIUM and compounds as Be	41
7440417	BERYLLIUM and compounds as Be	42
7440439	CADMIUM and compounds as Cd	61
7440439	CADMIUM and compounds as Cd	62
7440439	CADMIUM and compounds as Cd	63
7440473	CHROMIUM and compounds as total Cr	78
7440473	CHROMIUM and compounds as total Cr	79
7440484	COBALT and compounds as Co	83
7440484	COBALT and compounds as Co	84

CAS #	ANALYTE	ID #
7440508	COPPER DUST / FUME as Cu	85
7440508	COPPER DUST / FUME as Cu	86
7440666	ZINC and compounds as Zn	324
7440666	ZINC and compounds as Zn	325
7440702	CALCIUM and compounds as Ca	64
7440702	CALCIUM and compounds as Ca	65
7446095	SULFUR DIOXIDE	289
7446095	SULFUR DIOXIDE	290
7647010	ACIDS, INORGANIC (HCl)	11
7647010	HYDROGEN CHLORIDE	178
7664382	ACIDS, INORGANIC (H3PO4)	8
7664382	ACIDS, INORGANIC (H3PO4)	9
7664382	PHOSPHORIC ACID	260
7664382	PHOSPHORIC ACID	261
7664393	ACIDS, INORGANIC (HF)	12
7664393	HYDROGEN FLUORIDE	179
7664417	AMMONIA	21
7664417	AMMONIA	22
7664417	AMMONIA	23
7664939	ACIDS, INORGANIC (H2SO4)	7
7664939	SULFURIC ACID	291
7664939	SULFURIC ACID	292
7697372	ACIDS, INORGANIC (HNO3)	13
7697372	NITRIC ACID (HNO3)	236
7719097	THIONYLCHLORIDE	295
7738945	CHROMIUM VI (hexavalent Chromic Acid, CrO3)	80
7782492	SELENIUM COMPOUNDS AS (Se)	279
7782505	CHLORINE	72
7783064	HYDROGEN SULFIDE	180
8002742	WAX (PARAFFIN)FUME	321
8003347	PYRETHRUM	274
8006619	GASOLINE	164
8006642	TURPENTINE	314
8012951	MINERAL OIL MIST (WATER INSOLUBLE OILS ONLY)	227
8030306	KEROSENE	190

CAS #	ANALYTE	ID #
8030306	MINERAL SPIRITS	228
8030306	NAPHTHAS (REFINED PETROLEUM SOLVENTS)	233
8032324	PETROLEUM ETHER	256
8032324	VM&P NAPHTHA	320
8052413	STODDARD SOLVENT (PD680)	287
8052424	ASPHALT	35
10024972	NITROUS OXIDE	243
10024972	NITROUS OXIDE (FIELD IR METHOD)	244
10028156	OZONE	250
10035106	ACIDS, INORGANIC (HBr)	10
10102440	NITROGEN DIOXIDE	237
13463677	TITANIUM DIOXIDE	299
13838169	ENFLURANE (ETHANE OR ETHRANE)	122
13838169	ENFLURANE (Ethane or Ethrane)	123
19044883	ORYZALIN	249
22224926	FENAMIPHOS	149
22781233	FICAM (BENDIOCARB)	154
26675467	FORANE (Isoflurane)	155
26675467	ISOFLURANE	184
28523866	SEVOFLURANE	281
30560191	ORTHENE (Acephate)	248
34590948	DIPROPYLENE GLYCOL METHYL ETHER	116
38641940	ROUNDUP	277
57041675	DESFLURANE	98
65996932	COAL TAR PITCH VOLATILES	82
68131748	COAL DUST	81
	ASBESTOS IDENTIFICATION OF BULK MATERIAL	34
	BENOMYL (BENLATE)	37
	BENZENE SOLUBLES	39
	BROMINE	45
	CYANIDES (AEROSOL / GAS) as CN	89
	DIESEL FUEL MARINE	108
	DUST (RESPIRABLE)	120
	DUST (TOTAL NUISANCE)	121
	FIBER COUNT (CLEARANCE	150

CAS #	ANALYTE	ID #
	MONITORING)	
	FIBER COUNT (PERSONAL MONITORING)	151
	FIBROUS GLASS (as total NUISANCE DUST)	152
	FIBROUS GLASS (by FIBER COUNT)	153
	JP4	187
	JP5	188
	JP8	189
	LEAD in blood	193

CAS #	ANALYTE	ID #
	LIGROINE	194
	MERCURY in urine	203
	METALS	205
	NITROGEN DIOXIDE / NITRIC OXIDE (NOX)	238
	ORGANIC VAPOR MONITOR 3M (PASSIVE MONITOR)	247
	PESTICIDES	255
	POLYCHLOROBIPHENYLS (PCBS or AROCHLORS)	262

CAS #	ANALYTE	ID #
	POLYNUCLEAR AROMATIC HYDROCARBONS (PNAH)	263
	POLYNUCLEAR AROMATIC HYDROCARBONS (PNAH)	264
	SAFROTIN	278
	SILICA (CRYSTALLINE, RESPIRABLE)	282
	ZINC PROTOPORPHRYIN in blood	326